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JANUARY, 1934 Vol. IX., No. 1

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Index to Advertisers, see pages v & vi

FOOD Manufacture

Incorporating Canning, Packing, and Preserving

CONTENTS FOR JANUARY · 1934

The Editor's Comments. By Dr. H. B. Cronshaw, B.A., Ph.D., A.I.C. Page 1

Cereal Chemistry. By Thomas H. Fairbrother, M.Sc., F.I.C. Page 5

New Fruit Products. By Vernon L. S. Charley, B.Sc. Page 11

Chemical Tests for Vitamins. Page 16

Emulsification. By John W. Corran, B.Sc., Ph.D., F.I.C. Page 17

New Foods and Drugs Act in the U.S.A. Page 19

The California Peach Season of 1933. By Professor W. V. Cruess. Page 21

Food Colours. Page 24

Fish Canning. Page 26

Cherry Products. Part III. Page 29

Canning in South Africa. By John Morison. Page 31

Bread and Vitamin A. Page 33

Trade Notes. Page 34

Information and Advice. Page 36

Recent Patents. Page 38

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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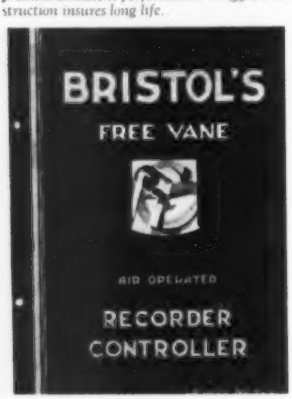

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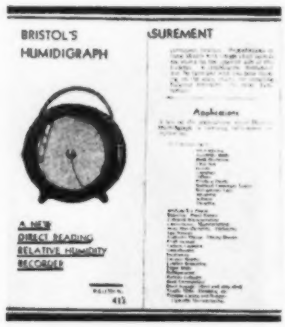

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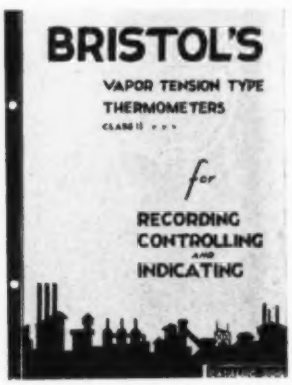

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Food Manufacture

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Vol. IX. January, 1934 No. 1

The Ninth Round.

THE EIGHTH volume of FOOD MANUFACTURE is, we fondly imagine, safely bound and tucked away on the reader's shelf—not too far away, however, for constant, easy reference. Nearby—again we hope—is a rapidly growing pile of the *Food Industries Weekly*, a companion publication designed to keep the reader in touch, week by week, with the events of the world of food production and the activities of those who play their part in that world. What more can a man require in the way of food for thought, ideas, and action? And we ask this in all seriousness and in anticipation of receiving a candid expression of readers' views.

So far as FOOD MANUFACTURE is concerned, the ninth exponent of the technology of food production is going to display a form far more spirited and vigorous than has been witnessed in any of its predecessors. So much the better for the reader and, indeed, for our own satisfaction. Anyhow, we throw this out as a challenge for the reader to take up twelve months hence.

Ethylene Ripening.

We had an interesting chat with Mr. G. R. Bates, B.Sc., who has just returned to Southern Rhodesia after a visit to this country. Mr. Bates is a plant pathologist and has been in charge of technical matters connected with the development in Southern Rhodesia of the artificial coloration of oranges.

This practice was first adopted on a commercial scale in U.S.A., and then spread to Australia, South Africa, and the West Indies. In an article which Mr. Bates has written for the next issue of FOOD MANUFACTURE, the opinion is expressed that in the near future it will be regarded just as important to colour oranges by this means as it is necessary to wrap them in attractive paper.

Apart from the initial outlay comprising the cost of chambers and equipment, the ethylene treatment is quite inexpensive. It is estimated that in Rhodesia the average cost of treatment per export box of oranges is round about one-third of a penny.

The exact nature of the colouring process is obscure. It has been suggested that ethylene acts as an enzyme accelerator. In view of the minute quantities of gas involved and the biochemical effects produced this theory appears to supply the correct explanation.

Honey.

To prevent deterioration of honey during storage or transport from hive to consumer is not an easy matter. It is liable to spoilage by fermentation, loss of flavour, and change of colour. The conditions determining these changes have been studied to some extent, but not perhaps as thoroughly as they might be. There is still room for more work in this field.

One who has devoted more attention than most people to the spoilage of honey is Professor H. F. Wilson of the University of Wisconsin. His contributions to this subject are better known to American apiarists than to their colleagues over here. Judged by the questions that have been put to us at various times, there is considerable interest in spoilage problems among those handling honey in this country and in various parts of the Empire. At our request, therefore, Professor Wilson has prepared an article on the spoilage of honey and some of the factors involved, which will be published in a forthcoming issue. This article should go a long way in removing difficulties with which many honey packers appear to be faced.

Central Heating for Orchards!

The idea of heating fruit orchards as a means of protecting the trees against late spring frosts might seem rather bizarre to many people, and yet there are over three million heaters in use in American orchards. Orchard heating has been used very successfully by a fruit farmer of repute in Kent, but it has not met with general commercial application here because the American apparatus that has so far been available has been too costly and farmers have risked frost damage rather than spend the money on the heaters. Recently, according to a correspondent in *The Times*, an English amateur, Mr. Harrington, has perfected a simple type of oil burner costing only a few shillings and burning a heavy oil that is relatively cheap. The sole object of heating an orchard is to protect the trees against the late spring frost, which, though it may occur only once or twice a year, may in an hour cause black ruin. It is most dangerous after the mild spells so characteristic of the first four months of the year in our climate. A ground frost at the critical time seldom exceeds 6 degrees, and if, when danger threatens, the farmer can raise the temperature above his orchard 3 degrees the danger will be staved off. Of course, he is powerless against very heavy frosts and wind frosts, which, fortunately, only occur very rarely. In California where fruit is grown in wide open spaces they use smoke clouds, but in this country where orchards are in close contact with towns and villages this is impossible, and hot air must be employed. About forty of the oil heaters per acre are used. A thermometer connected by a wire rings a bell in the farmer's house when the temperature has fallen to a certain point, and the farmer then turns out of bed and lights the lamps with a blow-lamp. As these frosts usually occur between 2 a.m. and 4 a.m. it is not very pleasant for the farmer, and a further refinement would be a thermostatic control which would automatically light the lamps when the temperature fell to a certain point.

Plant Breeding in Russia.

According to a publication of the Imperial Bureaux of Plant Genetics issued from Cambridge and Aberystwith, an active programme of plant breeding has been launched in Russia under the direction of Professor Vavilov, and it is stated that rapid progress is being made. The Soviet breeders have realised the inadequacy of the breeding material at their disposal and have made a systematic study of the economic plants of the whole world with the object of making as complete a collection as possible on which to base the breeding work of the future. These studies have led to the discovery of the centres of origin of the main cultivated plants, and that these centres are at the same time the points at which the greatest number of forms and characters of the plant concerned are concentrated. Thus they represent the source of the most valuable initial material for plant breeding. This material has been assembled in the Soviet Union and studied intensively and systematically, and monographs on the systematics of the primary crop plants have been prepared or are being compiled. The material is retained in the living state and has been distributed to the appropriate climatic zones of the Union. Thus living museums of all plants of economic interest to the U.S.S.R. have been created. Each of these world collections, in most cases, it is stated, unrivalled in completeness by any other collection in the world, presents opportunities for breeding on a scale far beyond the dreams of breeders of previous generations.

"Weatings."

Millers' offals have been known under a variety of names in different parts of the country, such as middlings, sharps, thirds, and toppings. Recently a proposal was made to designate millers' offals as wheat feed, but the old-established names still persisted everywhere except on invoices. It is now proposed by the Millers' Mutual Association that there shall be only two grades and that these shall be termed "weatings." The first grade must have a fibre guaranteed not to exceed 5·75 per cent.; and the second, "superfine weatings," with a fibre content of less than 4·5 per cent. This standardisation scheme applies only to the products of British mills, and the trade mark has been registered, so that in future there will be no confusion between imported milling products and the standardised home products. At the meeting called to inaugurate the change, it was stated that any attempt at standardising would be met with many conflicting points of view, and certain concessions had to be made. Some firms had found it almost impossible to get their fibre content as low as that desired, and certain permissions had been given in the case of the better class imported fine product and low-grade flour, but at least 80 per cent. of weatings would be home milled. This leaves the door open for any miller to buy up to 20 per cent. of his total output of offals as German or French middlings, which are notably low in fibre, and mix these with his own to reduce his fibre content. This would mean, however, an extra 20 per cent. of weatings on the home market, with presumably a corresponding reduction in the price fetched. The farmers should like the idea.

More Colorado Beetles.

It appears that we were a little premature in these notes last month when we congratulated the Ministry of Agriculture on its successful extermination of the Colorado

beetles at Tilbury. Officials of the Ministry of Agriculture who have been at Tilbury since the beginning of the autumn admitted a few days ago that they have found several more beetles. They were found at some depth underground in land which had been sterilised with disinfectant. This is rather disquieting, as it would appear that the methods used for sterilising the ground are not very effective. Apparently they drive the beetle further into the soil, and it will probably emerge when the effect of the disinfectant has worn off.

Tomato Storage.

Experiments on the storage of tomatoes at low temperatures have been carried out by R. Mulder and A. M. Sprenger. Their results may be briefly summarised as follows:

At 0° C. tomatoes in all stages of ripeness may be kept not longer than 5 days without damage, but at 7 days they begin to spoil. No increase of colour takes place in store, and when removed to warmer temperatures the fruits are found to ripen more slowly than those that have not been subjected to refrigeration. At 4° C. the results are little different to those at 0° C. There is slightly more colouring, but this shows an abnormal yellowish tint. Mould develops more quickly than at 0° C. At 8° to 10° C. half-ripe tomatoes can be kept up to 14 days. At 12° C. and somewhat higher all tomatoes which have just a trace of colour can be stored up to approximately 4 weeks for the most unripe. The best packing for these longer storage periods is peat dust. Fruit so stored should be consumed or preserved within 3 days of removal from store.

Apple Storage.

Tests have been made by the Cawthorn Institute of New Zealand on the influence of carbon dioxide on internal breakdown in apples. The temperature employed was 35° F., and the concentrations of carbon dioxide 0·4, 5, and 10 per cent., the remainder of the mixture being air. The fruit was kept under these conditions for $4\frac{1}{2}$ months.

On examination it was found that there was a definite increase in the amount of internal breakdown due to the presence of carbon dioxide, the breakdown increasing with the intensity of the CO_2 concentration. It is concluded that even carbon dioxide concentrations well below the danger limit for the production of brown heart (10 per cent. according to Drs. Kidd and West, of Cambridge Low Temperature Station) should not be considered safe for long storage of fruit at low temperature. Tests are now needed over a two-month period corresponding to the length of the overseas transport period from New Zealand.

Cranberry Bogs.

It is not generally realised that wide tracts of bogland in Massachusetts, New Jersey, and other states are cultivated for cranberries. Massachusetts alone has 14,000 acres of bogs which yield about 30 barrels of cranberries per acre. Professor C. R. Fellers of Massachusetts State College, writing in *Canning Age*, estimates the cost of bringing an acre of cranberry bog into bearing as about $1,400, and after that the upkeep is likewise high. Bogs must be flooded periodically to control insect pests, they must be sanded every two years to force the growth of new shoots, and, like other crops, must be weeded, sprayed, and harvested.

Cranberry Sauce.

While the fresh fruit market takes about 90 per cent. of the total crop, the percentage canned as sauce and other forms is becoming larger. The washed cranberries are cooked ("blanched") with an equal weight of water for 2 to 4 minutes. The skins crack and allow the flesh to soften. The charge then passes direct into the pulper or cyclone, where the skins and seeds are removed. The size of screen controls the texture of the sauce.

After leaving the pulper the hot material passes to steam-pans for concentration with sugar. Sugar is added in the proportions of 0·9-1·2 parts to 1 part by weight of cranberries, the actual proportion varying somewhat with the season. Cooking is done as rapidly as possible until a soluble solids content of about 43 per cent. is obtained as determined by refractometer or jellying test. Usually the proper finishing point occurs at 216° to 217° F. The concentration normally requires 5 to 10 minutes.

Filling into cans at above 180° F. obviates the necessity for a heat exhaust or retorting.

Corrosion Research.

Dr. J. M. Bryan of the Low Temperature Station, Cambridge, who contributed the article on "Metals in the Food Industry," published in last month's issue of this journal, recently presented two papers to the Faraday Society. One of these discussed the effect of *p*H on the corrosion of iron, and the other the effect of *p*H on the rate of oxidation of solutions of ferrous citrate. It will be recalled that Dr. Bryan, along with T. N. Morris of Cambridge, is responsible for most of the investigations made in this country into the corrosion of tinplate. Perhaps their best-known publication is Report No. 40, issued by the Food Investigation Board in 1931.

The food industry is fully alive to the importance of this fundamental work of Morris and Bryan. Without a firm basis of scientifically ascertained facts, questions of

the behaviour of metals in contact with foodstuffs under various conditions will continue to be answered by mere guesswork, and the whole subject will never be anything more than a hopeless confusion of opinions, clap-trap, and extravagant claims.

Baking Powders.

At the tenth annual meeting of the American Society of Bakery Engineers, held in March, 1933, Mr. J. L. Hawkins gave an interesting account of baking powders. The U.S. Department of Agriculture defines a baking powder as a leavening agent produced by mixing an acid reacting material and sodium bicarbonate with or without starch or flour.

There are, according to Mr. Hawkins, four principal classes of baking powders containing (1) cream and tartar and tartaric acid, (2) mono-calcium phosphate (the straight phosphate powder), (3) sodium aluminium sulphate and calcium acid phosphate, and (4) sodium acid pyrophosphate (alone or in combination with calcium acid phosphate and calcium lactate).

The starch is not added as a filler, but has the definite purpose of separating the acid from the bicarbonate to reduce interaction, and hence deterioration, to a minimum. Thus the available "gas strength" at the time of manufacture is commonly 17 per cent., although the legal limit is 12 per cent.

Practical Experience.

"While it is true," said Mr. Hawkins, "that one can obtain general information from books and data on possible formulæ and methods of compounding, etc., one will learn very little of the importance of the granulation or particle size of the various ingredients which influences the rate of reaction and prevents separation; nor as to the influence of certain substances on taste, keeping quality, or rate of reaction."

Fish Canning in Essex.

It is now about four weeks since British Fish Canning, Ltd., started operations at their third factory, situated at Hythe, near Colchester, the other two being at Leeds and Dundee. In April, 1932, we gave an account of the methods employed at Leeds for canning brisling, sild, and herrings, which had been developed by the splendid work of Mr. C. W. Banks. This pioneer of fish canning in Britain has equipped and organised the new Essex factory, and under his guidance we have had the privilege of making a thorough inspection of operations in full swing. Only a brief reference will be made here to one or two points of interest, reserving a detailed description for the next issue of this journal.

Brisling and Sild.

Most people appear to have a somewhat hazy idea of the meaning of the terms brisling and sild. Actually they are Norwegian words—brisling being applied to small, immature sprats and sild to small, immature herring. For the Hythe factory the brisling are drawn from the inshore fisheries off Aldeburgh in Suffolk and Brightlingsea and Southend in Essex. Their average age when caught is about two years and they are a really beautiful silvery, plump fish. The sild is not so attractive looking and its body is not so deep and plump. Its average age for canning purposes is about nine months, and it is drawn from the Firth of Tay and other places to supplement the supply of brisling when necessary.

It will be recollected that the mixed young of herring and sprat are known as whitebait. The percentage of sprats gradually falls from about 95 per cent. in February and March to 13 per cent. in June, rising again to 48 per cent. as the new brood enters the Thames estuary.

The Sprat.

The Norwegians and Germans have exercised considerable ingenuity in making the most out of the sprat. It is made into "anchovies," "delikatessen," "Kiel sprats," and so on, employing various forms of spicing and other treatments.

In pre-war days we used to have sprats which had been smoked and dried, but they appear to have now largely disappeared.

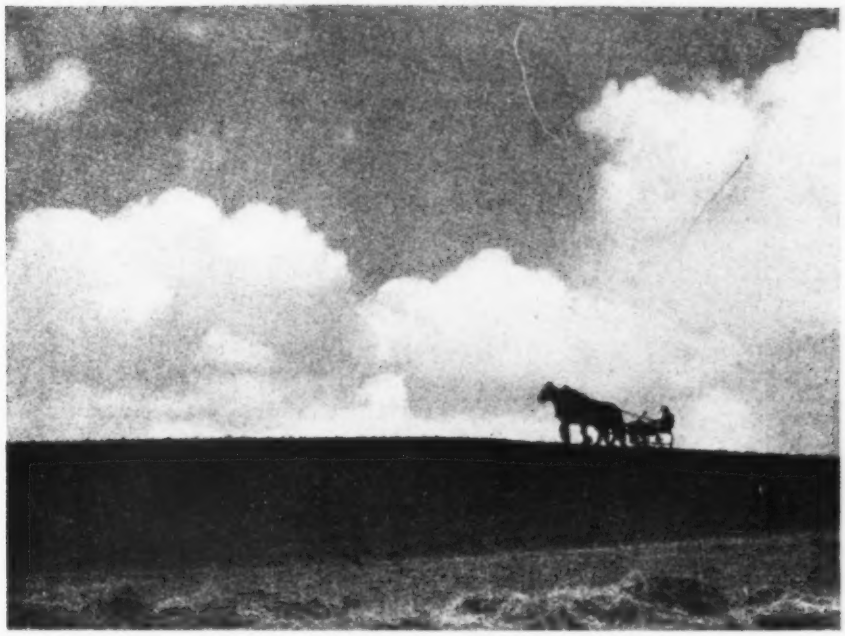
It is clear that much more can be done to popularise the sprat in its various forms, which should do much to relieve the present troubles of the inshore fishermen.

Vegetable Canning.

We are sorry to hear that the British vegetable canning is losing the valuable services of Mr. Donald Barr, who is returning to America. We had hoped that it would have been possible for him to remain here for at least another year, but the prospects of bigger game call him elsewhere.

However, during his brief stay he has been able to add his valuable quota of canning experience and knowledge to the general stock, and in that we are indebted to him.

Last month we published an article of his on the canning of green Lima beans; he has now left with us for publication in FOOD MANUFACTURE two articles of very great interest—"Stringless Green Beans" and "Carrots and Beetroots."



CEREAL CHEMISTRY

A REVIEW OF PROGRESS

By Thomas H. Fairbrother,
M.Sc., F.I.C., Chief Chemist
McDougall's Ltd.

PROBABLY ONE of the most important events in cereal chemistry—in this country at any rate—during the past year was the Symposium on Bread and Milk organised by the Food Group of the Society of Chemical Industry and held in the Great Hall of the British Medical Association in November. There, cereal chemists were able to hear the views of such outstanding workers in cereal chemistry as J. R. Katz of Amsterdam, Holger Jørgensen of Copenhagen, M. Samec of Jugoslavia, Bungenberg de Jong of Utrecht, and C. W. Brabender of Duisberg. To many who were present these had previously been just names—names that had become familiar as tabs to numerous papers appearing periodically in the journals devoted to cereal chemistry. Now the names became clothed with a personality, and all who heard the speakers will, in future, read their papers with even greater interest on account of the knowledge of the personalities of the authors. In addition to these distinguished visitors' contributions, papers were given and discussed by English chemists in the food industries. It was a pity that no outstanding American was present; one would have liked to welcome workers like C. H. Bailey, C. O. Swanson, J. A. Le Clerc, and M. J. Blish (to mention but a few) to this first symposium in England. Perhaps on a future occasion some of them might come. The Food Group of the Society of Chemical Industry is greatly to be congratulated on organising this gathering.

Flour Quality Tests.

Turning to the progress made in experimental work during the year, one is struck most of all by the amount of work devoted to the determination of flour quality, particularly by mechanised means. The first important paper to appear in 1933 on this subject was by Swanson and Working of Kansas. They classified the factors influencing the characteristics of dough and the quality of the resulting bread into three groups. First, those due to the protein or gluten structure; second, those arising from substances in the wheat other than protein; and, thirdly, those due to substances other than flour used in making the dough. The characteristics depending on the first group are fixed primarily when the protein is laid down in the endosperm, and secondarily by the external

conditions during harvest and storage. These factors are largely inherent in the wheat, but may be influenced by treatment subsequent to harvest. This group of factors influences the gas retention and, to some extent, fermentation tolerance. In the second group are starch, lipoids, mineral matter, sugar, and enzymes. Although starch is present to an extent of about six times the amount of protein and probably has an influence on quality, it has not yet been possible to measure this satisfactorily. Enzymes are very important in this group, as they may determine to some degree the gas producing capacity of the dough. The third group includes water, sugar, fat, salt, and yeast. The water in the dough apparently exists as free and adsorbed water. The free water probably exists as films on the surface of the starch and proteins. Both starch and protein adsorb water, and the line of demarcation between free and adsorbed water is not sharp. The measurement of water absorption is an important factor in judging flour quality. For years the baking test has played an important part as a method for evaluating the baking quality of a flour—this seems to be perfectly logical and many workers cling to it wholeheartedly. Fisher and Halton (*J.S.C.I.*, April 7, 1933) state: "The baking test has many drawbacks, but it appears unlikely that it will ever be replaced by any single test. When the various factors involved in flour quality have been separated for individual study and properly analysed, it may be possible to replace the baking test by a series of quantitative tests, among which the gluten swelling test or some modification of it may find a place. It is, however, in the highest degree, unlikely that the baking test, in spite of its many drawbacks, will ever be replaced by any single chemical or physical test." In spite of this, however, many efforts have been directed to a mechanical test that will either replace or supplement the test bake. It is probable that the first attempts in this direction were made by the Hungarian chemists Kozutany and Hankoczy some thirty years ago, when they made a farinometer in which a dough membrane was fastened between two flanges and then expanded by air pressure from below until it burst. This principle has been elaborated in various instruments, such as the Bühler Comparator in Switzerland and the Chopin Extensimeter in France. The latest developments in this measurement of gluten elasticity are the Brabender Farinograph and the Recording Dough Mixer of Swanson and Working. Mechanical details are superfluous in a review of this nature, and a very complete account of the mechanical considerations is found in Swanson and Working's paper in *Cereal Chemistry*, January, 1933. The results obtained so far indicate that the method may be valuable in checking variations in wheat mixtures if the characteristics of the classes and varieties are known. The method will probably not detect slight damage in wheat. The Brabender farinograph has had much publicity in this country and is being tested in several laboratories against comparative baking tests. The writer has not used the machine personally, but has had the opportunity of examining it and discussing it with several chemists who are experimenting with it. Preliminary investigations appear to indicate that the findings from the technique suggested by Dr. Brabender are not always in accordance with the baking test results. It seems evident that much more experimental work will be necessary before such a machine, even coupled with the fermentograph, will give reliable data as to the ultimate behaviour of a flour. The fermentograph is an instrument that has been devised to balance dough ripeness and the highest rate of gas production. It is claimed that this apparatus is a decided improvement on the older methods of determining gas power. These recent attempts to obtain some mechanical means to evaluate flour quality without having recourse to an actual baking test have been rather stressed in this review, not so much because of the results that have so far been achieved from their use, but in regard to their potentialities in the future. In the writer's view, mechanical methods will never give the whole story; such considerations as flavour, colour, and even texture will always prove a thorn in the path, but they might easily provide a considerable amount of very useful information in a short time that would otherwise only be obtained laboriously. In this connection the short method for the determination of gluten quality devised by Pelshenke of the University of Halle should be mentioned. He has compared the results obtained by his method with those got by Brabender's farinograph, Hankoczy's test, and Berliner's "swelling number of gluten" (*Cereal Chemistry*, January, 1933), and apparently good agreement is obtained.

Flour for Cakes and Pastries.

Most of the work so far described has referred to flour for bread making, but investigations have also been carried out on the softer flours that are more suitable for cake and pastry making. Platt and Kratz have reported (*Cereal Chemistry*, Vol. 10, p. 89) the results of an investigation on sponge cakes. The object of their work was to develop methods for recording the characteristics of test sponge cakes in a quantitative manner. Amongst other considerations, the softness was determined from the compressibility of the crumb (using a special apparatus), and the toughness by a study of the tensile strength. Some work on the measurement of the rate of staling was also described.

Investigations on the tenderness in pastries made from flours of varying strength have been carried out by Denton, Gordon, and Sperry at the Home Economics Department of the University of Nebraska. These workers have developed a method for making standard pastry wafers and testing their tenderness on breaking strength. In connection with the testing of cake flour, the investigations of G. L. Alexander of the Commercial Milling Co., Detroit, referred to in FOOD MANUFACTURE, November, 1933, issue, p. 361, should not be overlooked. Some attention has been paid to the evaluation of biscuit flours by Bohn of Chicago.

Vitamins.

As would be expected in these days of intensive vitamin studies, this aspect of cereal chemistry has not been

View in a Canadian Wheatfield.

neglected. Read and C. H. Bailey have published a long dissertation on "Certain Effects of Ultra-Violet Irradiation on the Chemical and Nutritive Properties of Baked Products." In this work studies were made of the antirachitic potency imparted to soda crackers when these were irradiated with a quartz mercury vapour lamp for varying periods of time at a distance of 12 in. For assay both bone ash and "line test" methods were employed. The results indicated that with irradiated hydrogenated shortening the antirachitic potency is carried through the fermentation and baking processes into the baked crackers. The crackers from the non-irradiated hydrogenated shortening showed no curative properties. Those made with shortening that had been irradiated for 5 minutes effected a rather advanced healing of rickets during a 6-day test period. Crackers with shortening irradiated for 10 minutes produced practically complete healing. The results at 15 minutes were slightly less satisfactory than at 10 minutes, and the inference is drawn that prolonged irradiation may destroy some of the vitamin D. The experiments were carried out on young rats.

Wheat Germ Vitamins.

Munsell and de Vancy have investigated the vitamin B and G contents of wheat germ, rice polishings, cottonseed flour, and the residue from fermented rye grains. Rats—on carefully regulated diets—were the test animals. The results indicated that samples of wheat germ, cottonseed flour, and rice polishings, were excellent sources of vitamin B. These three substances were found to contain approximately one-half as much of the antineuritic factor as did a composite sample of dried yeast. As a source of vitamin G they differed widely. Wheat germ was the richest of the three substances, containing about one-sixth as much vitamin G as did the yeast. Cottonseed flour was found to have about one-tenth as much of this factor as yeast, whereas rice polishings had only about one-twentieth. Whole wheat was found to be a relatively poor source of both vitamins B and G.

Yellow Corn and Rickets.

Experimental rickets are usually produced by feeding recently weaned Albino rats on a special diet such as the Steenbock ration. This consists of 75 per cent. yellow corn meal, 20 per cent. wheat gluten, 3 per cent. calcium carbonate, and 1 per cent. sodium chloride. Interesting investigations on the subject by Holmes and Tripp have indicated that the nature of the yellow corn is a very important factor and can cause great variations in the calcium-phosphorus ratio. Apparently the vitamin A content of yellow corn varies over wide limits according to the conditions under which it is grown and stored.

Value of Yeast in Bread.

An interesting paper on the value of yeast in bread was contributed at the Food Group Symposium by Dr. Vargas Eyre. His suggestion is to incorporate into flour a certain amount of dried yeast to augment the quantities of vitamins B_1 and B_2. He would add, say, 6 lb. of yeast per sack of flour instead of the customary 2 lb. now used in order to compensate for the wheat germ removed from white flour. The control of doughs containing so much active yeast is extremely difficult, and in actual bread making on a large scale is practically impossible. Eyre's suggestion is to add a certain proportion of dried yeast to the mix, as a kind of sleeping partner, keeping the quantity of fresh yeast about the same as usual. Baker's yeast can now be produced in the form of a fine powder, so prepared as to have no fermentative action on the dough, yet carrying with it the full vitamin B potency. According to Eyre, 4 lb. of fresh baker's yeast can be reduced to 1 lb. of yeast powder, the vitamin B content of which is four times that of the fresh yeast. Dr. Eyre's plea to use a lower grade flour in order to compensate for the extra cost of his dried yeast will not commend itself to millers or milling chemists, and it is extremely unlikely that the flavour brought about by the excess of yeast will commend the bread to the average bread eater, so that this proposed new "Health Bread" will probably only be taken in limited quantities by those food

faddists to whom the word vitamin is an open sesame and who would eat anything that they were assured contained extra vitamins.

Protein Studies.

The investigation of the proteins of wheat and flour is a hardy annual, and every year sees some fresh development in this direction. One of the most important contributions during 1933 was the seventh of a series of physico-chemical studies on proteins by Sinclair and Gortner. In this one they dealt with the peptisation of gliadin by solutions of inorganic salts. The work involved an investigation of the preparation of pure gliadin, and two recognised methods were employed—the original alcohol method of Osborne and the acetic acid method of Blish and Sandstedt. The purified gliadin was treated with neutral salts, and it was found that various concentrations of a particular neutral salt peptised different quantities of protein and also molecular solutions of various neutral salts affected varying amounts of gliadin; thus, potassium iodide had a greater effect than potassium bromide, which, in turn, had a greater capacity than the chloride.

Rich of Saskatchewan has published a paper on the relationship between ash content and the peptisability of wheat flour proteins. He concludes that the amount of wheat flour proteins peptised by a solution of a neutral salt of a strong acid and a strong base is very highly and positively correlated with the ash content of the sample. He goes further and states that most of the differences in the peptisability of wheat flour proteins are due to some factor which is very highly correlated with the ash content. In this connection, a paper by Sandstedt and Blish of Nebraska (*Cereal Chemistry*, 1933, p. 359) on "A New Characterisation of the Gluten Proteins" should be mentioned. The purpose was to give a new viewpoint as to the nature of the structural units of which wheat gluten is composed, and the conclusions are based upon extensive "fractionation" studies conducted over a number of years.

Variation of Protein Quality.

To the writer's mind, one of the most interesting papers of the year is that of Gericke of the Division of Plant Nutrition of California. He has been following up the work of Davidson and Le Clerc and his own earlier researches, which showed that the protein content of wheat may vary with the supply of available nitrogen to the plants. Originally his plants were grown in soil, but he has now developed an aqueous cultural method on a scale sufficiently large to provide samples for milling and baking. This method was adopted to differentiate the quantities of each nutrient absorbed by wheat, which obviously necessitated a technique by which nutrients could be withheld from the culture medium during the later growth periods of the plants so as to preclude absorption. The method consists of a seed-bed mounted over and in contact with a water surface provided by long shallow reservoirs filled with water. The seed-bed consisted of poultry netting stretched tightly over the tops of the reservoirs and burlap resting on the wire to hold the seed. Each reservoir, depending on size, had one or more "fertilising units," which consisted of bottles with restricted outlets containing the essential elements as solid salts. The elements were discharged into the water at such a rate as was required to maintain the proper physiological condition for growth of plants. The water culture method appears to be the only means by which satisfactory material can be obtained for studies on the physical properties of wheat protein, as the natural method of culture does not permit investigators to analyse their data in terms of specific and sharply defined nutritional factors. The earlier investigations of Davidson and Le Clerc, of Gericke himself, and Davidson and Shollenberger showed that nitrogen absorbed during the later growth stages of the plants may markedly affect the quality of the grain, and also that such treatment may reflect itself in bread of greater excellence than that obtained from samples not so treated. Gericke has now shown that high protein grain obtained by the method described above may result in bread of poorer quality than that obtained from untreated samples, and suggests the probability of a process occurring in the later growth phases of the plant as cause for variation in the quality of the protein of wheat flour.

Rancidity.

Triebold, Webb, and Rudy have continued their study of Oxidative Rancidity of Special Interest to the Cereal Industry. One phase of the rancidity problem which is receiving a lot of attention is the study of anti-oxygenic catalysts. This study has followed three main lines of investigation: (1) a search for new antioxygens, (2) fundamental studies to account for the action of antioxygens, and (3) an attempt to determine the nature of antioxygens naturally present in fats. In the course of their work they have investigated the discovery of Greenbank that maleic acid added in the proportion of 1 in 10,000 would lengthen the keeping time three to five fold. They did not confirm this. The whole study of rancidity is very complicated, but some progress is being made in a very difficult field.

Macaroni Products.

No review of the year's work in cereal chemistry would be complete without reference to the masterly paper on Macaroni, Spaghetti, and Vermicelli, by J. A. Le Clerc in *Cereal Chemistry*, September, 1933. He deals with the history, production, consumption, types preferred, cost of manufacturing, raw materials, definitions and standards, specifications, food values, and macaroni made from materials other than wheat. The Chinese make vermicelli from potato flour, mung bean, and rice. The Mexican Indians make it from maize. This paper is one of the most comprehensive accounts of macaroni products that the writer has come across.

Analytical Methods.

For obvious reasons full details of all the new analytical methods and improvements on old ones cannot be given

Combine Operating near Glamis, Saskatchewan.

in a review ot this nature, and doubtless many omissions will occur.

Ferrari has worked out a spectrophotometric equipment for quantitatively determining the carotinoid pigments of wheat flour. A flour extract is prepared with a mixture of naphtha and alcohol (93 parts and 7 respectively). The procedure requires standing overnight, followed by centrifuging at high speed. Readings are made with a Koenig Martens spectrophotometer at wavelength 435·8mμ, first with the pigmented extract in one beam and then in the other. Transmittancy is related to carotin concentration, and the results are expressed as parts of carotin per million of flour.

Baker, Parker, and Freese have developed a method for the measurement of colour in flour and bread by means of Maxwell discs.

Harrel and Duoos have contributed a paper on economical muffle furnace operation that should prove valuable.

Analytical Reports.

L. H. Bailey has presented a report on the testing of rye flour, and Mangels one on various methods of analysis including viscosity, Kjeldahl test, and Schoorl's volumetric determination of sugar. J. T. Flohil has submitted a report on the volumetric copper reduction method for sugar determination and described the Schoorl method in detail (*Cereal Chemistry*, September, 1933, p. 475). Schultz and Kirby have described a biological method for the determination of different sugars in starch degradation products, and Blish and Sandstedt have developed an improved method for the estimation of flour diastatic value. Osborn and Krasnitz (*J. Ass. Off. Agr. Chem.*, 1933, p. 110) have compared the comparative efficiency of selenium, copper, and mercury catalysts in the analysis of flour by the Kjeldahl method. They recommend a combination of selenium with mercury oxide as preferable to a single catalyst. Experiments carried out by the writer some years ago do not show that selenium or mercury have any advantage over copper sulphate.

In the matter of laboratory devices, the apparatus for the convenient and accurate delivery of solutions used in experimental baking tests developed by Talbott and Weaver is of interest. It seems rather complicated, but the inventors claim that it is "simple to arrange, is not expensive, and can be maintained in a sanitary condition with little care." Dr. Elion of Holland has developed a simple volumetric method for measuring gas production during dough fermentation. He has produced a simple water displacement gasometer for measuring the gas produced during dough fermentation. It can easily be constructed in every laboratory and enables one to maintain a constant gas pressure during all readings, in which the measured water volume is equal to the gas produced.

Economic Questions.

The year under review has seen the first year's complete working of the Wheat Act in England. This, from an American point of view, was fully dealt with in the December issue of this journal. Owing to the increased production of home-grown wheat and the low world average price of wheat, the quota imposed has had to be increased from 2s. 3d. per sack of flour milled to 4s. 6d. This is being reflected in an increased price of bread. To the cereal chemist the more important fact is the increased amount of weak wheat to be dealt with. Europe in general has had a very big harvest—mainly of soft wheats. Presumably the bread consumption will not increase to any appreciable extent, and the importation of strong wheats to Europe will probably remain about the same as in recent years. This will leave a bigger surplus of soft wheats available which will have to be consumed somehow. This will probably have the effect of reducing the price of soft wheats still further. This will mean that the bounty paid to English farmers by the Government will be still greater. In the remote event of the Government stopping the subsidy the English farmers will be worse off than ever, as they will have an increased acreage of a lower priced product, and if the subsidy is continued and increased the consumer of bread will also

(*Continued on page* 28.)

COCOA FERMENTATION IN WEST AFRICA

WHEN De Candolle, in his *Origin of Cultivated Plants*, wrote concerning cocoa, "I imagine it would succeed on the Guinea Coast" (as the West African coast is sometimes called), he showed a trained imagination. Its success has been phenomenal, as Mr. A. W. Knapp so ably showed in his paper to the Society of Chemical Industry on December 14 at the University, Birmingham. On the Gold Coast and in Nigeria the plantations are owned and worked by the natives, and it is the most striking example known of rapid development in a native-owned industry. Although its introduction is relatively recent, these two British possessions produce more than one-half of the world's cocoa.

The quality was poor at first, as the natives had no knowledge of proper preparation for the market. It has much improved, but still leaves something to be desired. As the quantity produced is so great, the methods of fermentation and drying used there are of considerable importance to the world's cocoa and chocolate manufacturers.

The cocoa beans as they come from the pod are covered with a fruity pulp, and in this condition would be unsuitable for sending to market. Up to 1900 the great bulk of the cocoa exported from the Gold Coast was simply dried in the sun. Now the great bulk is fermented. Although the word "fermentation" is correctly used in connection with cocoa to indicate a kind of spontaneous decomposition which produces alcohol, it may easily convey a wrong impression, for the small amount of alcohol produced is not the object or the end of the process, the alcoholic liquid being a by-product which is thrown away.

The object of the fermentation is to produce a cocoa bean which gives a fine-flavoured cocoa or chocolate, and the native farmers ferment their cocoa because it then fetches a higher price. Mr. Knapp described in detail the various methods used by the farmers and discussed the yeasts and other organisms responsible for the changes which occur during fermentation.

Although several carefully devised processes have been invented, no alternative gives so good a cocoa bean as a well-conducted fermentation. Mr. Knapp discussed the method by which the farmers could further improve the cocoa beans—*e.g.*, by collecting only ripe cocoa, by fermenting in boxes, by careful mixing, etc. He congratulated both the farmers and the Government on the advances in quantity and quality which had already been made.

A CALORIFIC HERCULES

I WAS lunching the other day with some journalists when the discussion turned on the recent report on nutrition issued by a special committee of the *British Medical Journal*. From there it ranged to dietary problems in general, and one of the company asked for an "expert" opinion about the possibility of mankind one day taking all its food in the form of two or three small pellets per day. A professor of physiology who was present shook his leonine head with great sapience and said "No." The extreme wisdom of his appearance was further augmented by the laconicity of his reply. A well-known food chemist was also present, and was a good deal more vocal. His argument may interest my readers.

"The most combustible substances known," he said, "are carbon and hydrogen. Hydrogen is obviously unsuitable for compression into tablets; but let us assume that man requires, not bread, but calories alone, and can take them all in the form of the densest combustible solid material to be found anywhere. This is the diamond. The calorific value of the diamond is 7·9 large calories per gram; its density is 3·5, so that 1 c.c. (millilitre, to be more precise) will give just over 27 calories on combustion. According to the report we have just been discussing, an adult man needs, without waste, 3,000 calories per day. He would therefore need about 110 millilitres of diamond, which is a little under a 2-in. cube. Even the higher calorific value of hydrogen does not bring hydrocarbons up to the level of diamond in respect of their compactness for purposes of combustion. The lowest hydrocarbon liquid at atmospheric temperature, pentane, will only yield 7¼ calories per millilitre, as against 27½ yielded by the diamond. Even graphite is better than pentane, for a millilitre will yield 17 calories, so that a block of graphite occupying 180 millilitres would supply the daily calories. This volume is occupied by a cube with rather more than a 2-in. linear dimension. No allowance whatever is made in these calculations for air spaces or for all the other essential dietary constituents, none of which has anything like the density of pure carbon. The whole 'pellet' concept is not merely mythical but nonsensical."

After this pronouncement he took a long pull at his tankard and went away to carry on those many nefarious operations with which the food chemist is debited by the medical officers of some Government departments.

B. L. A.

NEW FRUIT PRODUCTS

By

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IT WAS pointed out in the first part of the present series (November, 1933, issue) that large quantities of surplus English fruits are available for the manufacture of a variety of food and beverage articles which should possess attractive selling capacities. Details of preparation will be considered in the present article under the main headings of (1) Juice Extraction and Filtration, (2) Syrups, (3) Concentrates, (4) Wines, (5) Liqueurs.

(1) Juice Extraction and Filtration

For all the products to be discussed it is necessary first to extract the juice from the fruit. In the case of the apple this is effected by grinding the washed fruit in a "grater" type of mill, as used for cider, and expressing the juice from the resulting pulp by means of hydraulic presses capable of giving pressures of 600 lb. per square inch. While it is advisable where berry crops are concerned to adopt a similar treatment, very little loss of efficiency is encountered by smashing the fruit in large casks with some form of pounder.

The process of disintegration is aided in soft fruits by allowing the smashed pulp to remain unpressed until a certain amount of fermentation has ensued. Gooseberries, strawberries, and black currants are so extremely slimy in consistency that any attempt to remove the juice by pressing immediately after milling is doomed to failure. It is not unusual in following this procedure to find that the cloths, into which the pulp is poured prior to expressing the juice, are broken, leading to serious losses. In all cases with soft fruit it is advisable to allow a gentle fermentation to commence, say for two to five days. There is little danger of obtaining too high an alcoholic content in juices destined for the soft drink market, for the sugar content of such fruits is low, and at temperatures round about 70° F. it should be safe to allow fermentation to pursue its course for the above-stated period. It is usually found that the fruits themselves will carry sufficient yeasts to give the necessary fermentative action, but to accelerate matters about 2 gal. of water and 2 to 4 lb. of sugar may be stirred into each cwt. of the smashed fruit. Using this treatment, black currant pulp, thoroughly pounded, which was sufficiently thick to be incapable of being stirred, became in 48 hours so considerably loosened in texture that it could be poured into the press cloths.

The importance of obtaining a sufficiently liquid material before pressing is largely due to the increased quantities of juice yielded by such a preliminary treatment. Using a small mill capable of dealing with a quarter of a ton of fruit per day, and fitted with a hand-operated hydraulic press, all the berry crops gave yields of approximately 8 gal. of juice per cwt. of fresh fruit; without the initial fermentation this yield is lowered, in some cases by over 20 per cent.

Working on the principle of utilising the fruit to its utmost limit, it has been found possible to extract the press-cake left from the first expression of juice. The cake should be disintegrated, either by hand or by a "pomace picker," and soaked in water and some sugar until fermentation has made considerable headway. This procedure will be referred to later in the section on wines.

A complication in the above working conditions is afforded by rhubarb. German literature advises the soak-

Fruit Washing Machine at Long Ashton.

ing of short 6-inch sticks in water and sugar for a week, with subsequent fermentation of the liquor after decantation. Experience gained at Long Ashton, however, has shown that fuller flavours are obtained by milling the sticks and allowing these to ferment in the dilute sugar syrup.

American practice favours the use of heat. The crushed berries are heated to 140° F. and pressed immediately. Apart from the highly corrosive action of most fruit juices on metallic surfaces, this method is not considered so satisfactory as the fermentation process on the ground that the flavours of such juices are very susceptible to heat, and the fresh fruit flavour, aroma, and bouquet, on which the ultimate value of the product will largely depend, are liable to be vitiated by exposure to such elevated temperatures. Experiments at Long Ashton, however, in the case of black currants have illustrated the use of this heating treatment in extracting the colouring matter from the skins of the fruits and in precipitating a considerable amount of colloidal material.

The filtration of fruit juices has been effected with the usual pulp filter as used in modern cider-making factories. The pulp is capable of being cleaned and used repeatedly. Plate and frame filters can also be used in conjunction with some form of filter-aid. When either process is being followed it is essential to allow the expressed juice a certain period for sedimentation to remove as much as possible of the suspended material and thus lengthen the life of the filter packing. The juice may also with advantage be run through double muslin or even material with a finer weave. Even with these precautions it has been found that some juices are still so slimy that the filter is soon choked with colloidal material and ceases to function. In such cases, the use of a pectin-decomposing enzyme will help to solve the difficulty. About 0·5 per cent. of enzyme base is added to the juice, and 24 to 48 hours allowed for completion of the reaction. A two-fold acceleration in filtration is thus achieved, for part of the colloids are actually deposited while some of them are solubilised and go into true solution and thus pass through the filter without difficulty. Careful syphoning will separate the juice from the sediment, and the final filtration will be hastened and converted into a more economical process. Excellent results were obtained by this method on 30 gal. of strawberry, 24 gal. of black currant, and 12 gal. of raspberry juices respectively. In the first two cases the filtration process of the untreated material was extremely slow, with the filtrate coming through still slightly opaque, whereas filtration of the treated juices gave a brilliantly coloured liquid with no trace of opaqueness. (The effect of the enzyme was not so noticeable in the case of red currants and loganberries, but in the latter case no difficulty was encountered in filtering the untreated juice.)

The relatively high temperatures prevailing during the summer months, when the manufacture of these products would naturally be carried out, make it necessary to be able to effect some control over the fermentation of juices undergoing enzyme treatment. The separation of the insoluble portion of the pectous material to as complete a degree as possible is vitiated by any active fermentation. It is advisable to add 4 oz. of K.M.S. (potassium metabisulphite) per 100 gal. of juice immediately any signs of gas evolution are observed.

(2) Syrups

In the trials so far completed at Long Ashton, white cane sugar only has been used in any treatment demanding sweetening, and references in this article to "sugar" must be taken to refer to this form only. The preparation of syrups was divided into two series. In the first case, the freshly filtered juice was mixed with the necessary quantity of sugar in the cold; solution was effected by intermittent stirring, but commercial percolators and

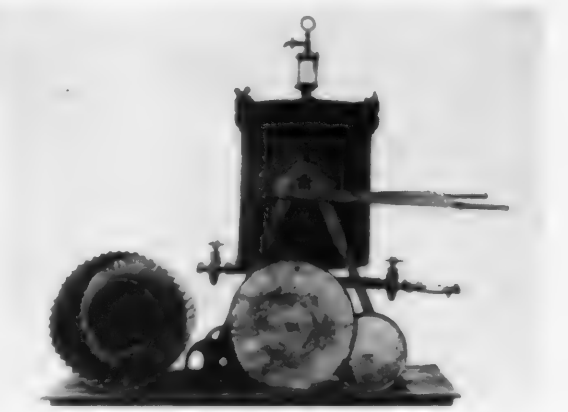
revolving extractors would be more efficient for large-scale manufacture. Those of the second series were made by boiling the juice with sugar, completely removing the scum, and bottling the syrup into warmed receptacles.

In the case of fruits which are usually consumed in the fresh uncooked condition, such as strawberries and raspberries, the flavours of the hot process syrups are slightly inferior to those prepared in the cold. In the former cases the flavour was reminiscent of an extract of jam made from the appropriate fruit, the fresh fruit flavour being masked by the slightly "cooked" flavour of the syrup. In loganberries, black currants, and blackberries the flavour of both types of products was excellent.

A serious disadvantage of the cold process, however, is the slightly hazy appearance of the syrups. This opacity is removed to a certain extent on standing for several months, but the brilliancy of the hot process syrups is seldom attained by those made in the cold. The fault is probably due to the sugar, for in the case of red currants a syrup was used to replace the solid sugar. In preparing the sugar syrup the formation of a considerable amount of scum during the boiling was observed, on the removal of which a water-white product was obtained; this, on mixing with the clear, filtered fruit juice, gave an attractive red syrup which has maintained its clarity for over two years.

One of the most important questions arising in the manufacture of pure fruit syrups is that of the degree of sweetening advisable. To prevent a syrup fermenting on storage, even under the adverse conditions of domestic routine, where bottles may be opened and their contents consumed over a period of days, it is necessary to make a syrup which contains 65 per cent. of sugar. This corresponds to a specific gravity at 15·5° C. of 1·316. Such

Seitz Filter.



Pulp Filter.

a syrup will keep indefinitely, and no risk of fermentation or mould growth will be incurred. But a syrup produced in this way will suffer from a considerable dilution of fruit flavour by the addition of so much sugar. To meet this objection, syrups with 45 per cent. sugar (specific gravity 1·203) have been studied. Such products are very "fruity," but offer a "happy hunting ground" for yeasts and other forms of micro-organisms present in the juice or which effect an entrance through the cork. Unless stringent precautions are taken to remove or kill these cells, fermentation will inevitably result, spelling disaster to the whole pack. At the present stage of the work pasteurisation of such syrups offers the most practicable solution to the problem. Effective control is obtained by heating at 165° F. for half an hour. (These data refer only to pasteurisation in white whisky bottles.) In certain brilliant syrups, yeasts can be removed by filtration through a germ-proof filter (Seitz E-K), but the rate of treatment is extremely slow; 45 per cent. syrups can be filtered through a thin layer of paper pulp to a high degree of clarity.

Uses for Syrups.

There would appear to be an outlet for such syrups, marketed in attractive white bottles, for domestic use. In a previous article various suggestions for the utilisation of syrups in the home have been enumerated, and to these may be added the preparation of table jellies by use of the appropriate amounts of pectin or pectin-acid mixture. On the other hand, it should be emphasised that serious consideration should be given to the soft drink trade. The stable syrups enable an all-the-year-round supply of fruit base to be available in a suitable form; dilution with from 2 to 4 volumes of water followed by filtration, if necessary, and carbonation, will afford splendid articles from the selling standpoint, attractive in colour, clarity, flavour, and thirst-quenching properties.

From the dietetic point of view, in comparing ordinary mineral waters bearing high-sounding fruit names with the pure fruit product, the scales are heavily weighted against the former article. The diluted syrups should be car-

Modern Grater Mill.

(By courtesy of S. Stowe and Sons, Ltd.)

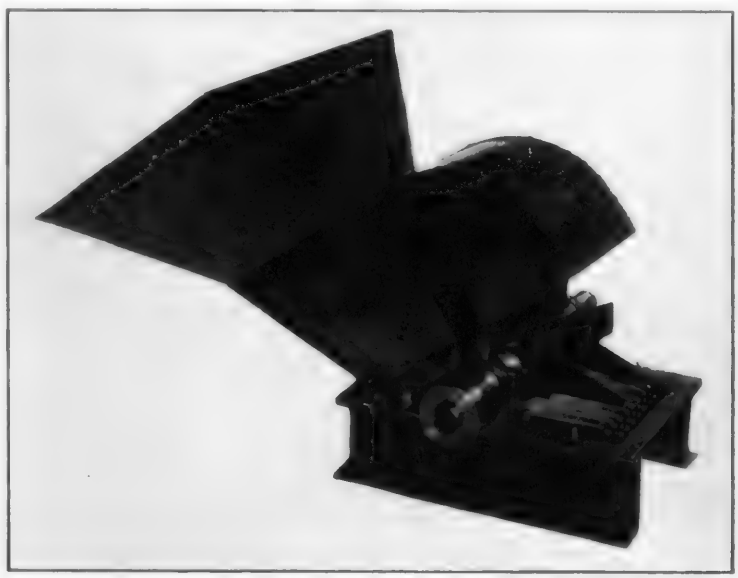
bonated at a pressure of 30 lb. per square inch of carbon dioxide. This allows a lower pasteurising temperature to be used than would be necessary for an uncarbonated juice.

If heat treatment is not favoured, filtration through a germ-proof filter is the only alternative. In this case it is necessary to place the filter immediately before the carbonating machine; all tubes, pipes, joints, pumps, interiors of carbonating and bottling machines must be carefully sterilised (2 per cent. SO_2 is a suitable agent), and corks and bottles must be similarly freed from micro-organisms of any type.

A word in passing on the question of home-made fruit liqueurs. A whole variety of products can be made by mixing the syrups with various forms of spirits according to individual taste. A series of bottles of syrups contain the material for endless experimentation of a delightful nature, delving into the mysteries of the delectable blends that can be produced in this way.

(3) Fruit Concentrates

A series of these were prepared from fresh fruit juices by the vacuum distillation method; glass vessels were used and the temperature was maintained at 40° C. Strawberry, black currant, red currant, blackberry, raspberry, and loganberry juices were concentrated, and in all cases the product suffered from a diminution of fresh fruit flavour. In several cases the beverages obtained by dilution of the concentrate with water were attractive in colour and flavour, and although each product was quite dissimilar from that made from the same fresh fruit juice, the flavours were not devoid of pleasant characters and interesting possibilities.



Pomace Disintegrator.

(By courtesy of S. Stowe and Sons, Ltd.)

(4) Fruit Wines

A large number of wines were made from the fresh juices described above. There was no need for filtration of the juice, for a natural clarification is produced during fermentation. Cane sugar, to give the appropriate specific gravity, was added; for a sweet wine, of the heavy dessert type, it is advisable to make up the juice to a gravity of 1·100 and ferment to about 1·040. For a dryer type of wine, an original gravity of 1·075 is sufficient, and the wine is then filtered at 1·015. The fortified juice may be allowed to ferment naturally, or a culture of wine yeasts may be added to afford a vinous character to the wine. Successful tests have been carried out with a yeast from Portuguese grapes.

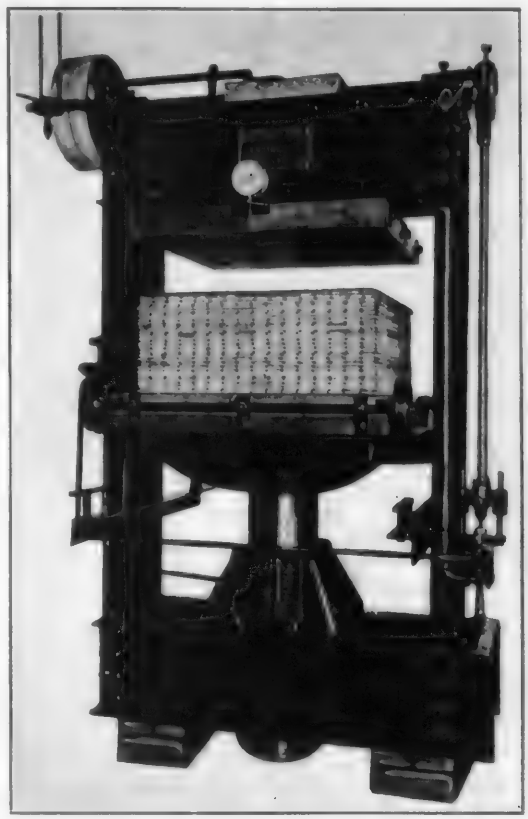
Should fermentation become protracted, ammonium phosphate at a rate of 2 oz. per 100 gal. of juice should be added. On the contrary, if fermentation proceeds violently, the delicate blend of flavours which contribute to the bouquet will be damaged. The rate may be slowed down by "racking" the wine to a clean cask, leaving the lees behind.

Owing to the very high acidities of most of the fresh fruit juices, it has been found necessary in most cases to dilute the juice with a quantity of water which is directly correlated with the acidity. The fruit juices mentioned in this article, with the exception of the strawberry, can with advantage be diluted with about 40 per cent. of water, and then sweetened with sugar prior to fermentation.

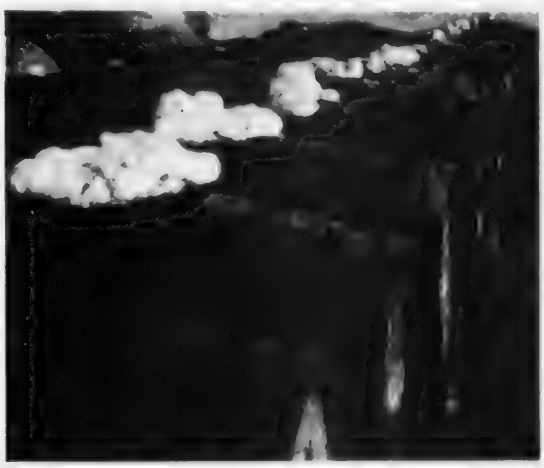
In view of the fact that the dry wines—*i.e.*, those in which the sugar has been almost completely fermented away—are not so satisfactory as the sweet types, it is necessary to be able to check the fermentation at any given moment in order to retain the required amount of sugar. If forced through a tightly packed pulp filter, such sweet wines will retain their sugar over long periods in casks, thus enabling the complex chemical changes involved in maturation to proceed. A final germ-proof filter may be used just before bottling.

To make the fullest possible use of the crushed fruit, the press-cake remaining after the first expression of juice may be macerated with water, sugar added, and the pulp allowed to ferment for about 5 to 8 days. This results in a disruption of the majority of the cells in the fruit tissues and the aromatic constituents are in prominence in the ultimate product. With loganberries, the press-cake from 1 cwt. of fruit was soaked for 2 days with 3½ gal. of water. After pressing, 5 gal. of dark red juice of gravity 1·006 was obtained. This was sweetened to a gravity of 1·100 and fermented down to 1·020. The wine was excellent in colour and flavour, the latter being well balanced with a pleasing acidity rather dominating the other characters. In the case of strawberries, the press-cake was macerated with 10 lb. of sugar and 6 gal. of water. Active fermentation commenced in a few hours and after 3 days the material had become quite liquid. Eleven gallons of juice of gravity 1·040 were collected and fermented after sweetening to 1·075. The flavour was fuller than from the freshly expressed juice.

Wines whose alcoholic content is 7 per cent. (by weight) or above are not liable to suffer from the disorder of acetification. But during the early stages of fermentation, when the alcohol is rising through the 2 to 4 per cent. region, the risk of acetic acid formation is considerable. Casks and vats must be well coopered, fermenting locks fitted to the casks to exclude air, and no appreciable amount of ullage (air space) should be allowed to form in the top of the cask. The formation of a yellowish



Fruit Juice Press.
(By courtesy of S. Stowe and Sons, Ltd.)



Casks of Apple Juice throwing up a White "Head."

leathery film on the surface of the liquor should be taken as an indication that acetic bacteria (*B. xylinum*) are present. Steps should immediately be taken to speed up the fermentation.

(5) Fruit Liqueurs

An extension of the wine programme in the direction of liqueurs was commenced at Long Ashton, and the writer has been fortunate in preparing some remarkably good liqueurs from two English soft fruits. The method adopted for their production is quite straightforward. In the case of the loganberry, a wine containing 12 per cent. of alcohol (by weight) was distilled in an upright copper still of the French type. The "foreshot" was disregarded and the rest of the spirit collected in glass vessels. After evaluation of the alcohol, which was generally about 46 per cent., the spirit was mixed with a loganberry syrup; for the preparation of a heavy dessert liqueur a 65 per cent. sugar syrup was used, while a light product was made from 45 per cent. sugar syrup, the latter being associated with a lower percentage of alcohol. The preliminary trials with this fruit and strawberries are most promising, and it is certain that the results will improve as ageing effects continue. From 3 to 5 years is the period normally allowed for maturing French liqueurs, and until the products prepared at Long Ashton have remained in wood for a similar period, no fair comparisons may be drawn between the English and Continental products.

The simplicity of the "syrup plus spirit" method of preparation should recommend itself to householders, and has the advantage of forming an additional outlet for the fruit syrup pack.

CHEMICAL TESTS FOR VITAMINS

A recent discussion at the Society of Public Analysts

AT an ordinary meeting of the Society of Public Analysts held recently at Burlington House there was an interesting discussion on the chemical (as distinct from physiological) tests for vitamins.

Mr. A. L. Bacharach, in opening the discussion, first considered the general analytical principles involved in the determination of vitamins and similar "trace" substances. He then outlined the present state of knowledge of the chemistry of the individual vitamins, of which one, vitamin C, has been synthesised. Of the others, most is known about the constitution of calciferol (vitamin D) and vitamin A. He enumerated such chemical tests as had been used or suggested for the estimation of vitamins, of which the two most important were the Tillmans-Harris test for ascorbic acid (vitamin C) and the antimony trichloride test for vitamin A. The former he left to be discussed by Dr. Harris himself, and summarised the present state of knowledge of the vitamin A test. After pointing out the limitations of the test, and the difficulties involved in its interpretation, he concluded by emphasising its great practical importance, especially to manufacturers of vitamin A concentrates.

Dr. Leslie Harris, discussing the most accurate methods of applying the antimony trichloride test for vitamin A, said that for quantitative work it was essential to saponify the oil, substances interfering with the production of the blue colour being removed by hydrolysis. For vitamin C a quantitative method based on the use of Tillman's indophenol indicator has been made more nearly specific by a preliminary removal of interfering reducing substances. Although in exceptional cases (*e.g.*, malt extract) the method broke down, yet it was of value in exploratory work. Vitamin C had thus been detected in many unexpected places, such as the lens of the eye, and the findings had been confirmed biologically.

Professor J. C. Drummond directed attention to certain defects in the B.P. procedure for the antimony trichloride test. If the influence of dilution were neglected abnormal results were obtained. The colours should be matched at the period of maximum intensity, and reliable results could only be obtained with the unsaponifiable matter. There was a close correlation between the blue tintometer readings and the spectroscopic test, especially with halibut liver oils.

Dr. R. J. McWalter demonstrated the construction of the Hilger spectrograph and the use of the 3,280 spectrographic band in the estimation of vitamin A.

Mr. Norman Evers showed that even the blue value of the unsaponifiable matter of cod liver oil might not be the true vitamin value. He pleaded for uniformity in the method of expressing results.

Mr. S. K. Crews and Mr. S. J. Cox read a paper on "The Relationship between the Carr-Price value and 328 m.u. absorption coefficient of preparations containing vitamin A." They showed that the purification of vitamin A products removes substances which inhibit the blue colour and that eventually the ratio of the Carr-Price blue colour value to the ultra-violet absorption coefficient rises and tends to become constant. Details of the procedure for obtaining consistent results were described.

Dr. K. Coward said that in view of the international standards that were being issued an increasing degree of uniformity might be expected in biological methods, and she still put more faith in them than in chemical methods.

Mr. A. H. Bennett contributed a note on the titration of vitamin C in citrus juices by the use of Tillman's indophenol indicator. According to him, if iron is present in the juice, a correction must be applied.

Mr. K. Donovan pointed out that the addition, not only of sulphur dioxide, but also of any antiseptic substance to the juice to prevent fermentation would also destroy its vitamin C activity.

EMULSIFICATION
BY MUSTARD

By JOHN W. CORRAN, B.Sc., Ph.D., F.I.C., Chief Chemist, J. & J. Colman Limited, Carrow Works, Norwich.

After discussing certain general aspects of emulsification in practice, the author describes experiments he has carried out on the preparation of emulsions, with particular reference to mayonnaise, using mustard as an emulsifying agent. His results are of great interest to manufacturers.

IN THE *Glass Packer* for October, 1932, p. 621, Dr. L. B. Kilgore, ex-Research Fellow of the American Mayonnaise Manufacturers' Association, contributed an article in which he demonstrated the emulsifying qualities of mustard. The three methods he used were based on:

(1) Foaming power of a solution of the substance in water.

(2) The stability of oil drops on the surface of such a solution.

(3) The stability of simple oil and water emulsions made with the solution as the water phase and sole emulsifying agent.

In the first experiment he found that increasing the amount of mustard in water resulted in a regular increase of the foam formation.

The second experiment showed virtually that mustard reduces the interfacial tension between oil and water.

In the third experiment he demonstrated that when emulsions formed by oil-in-water mixtures are shaken up they are more stable when mustard is present, and the stability increases as the concentration of mustard is raised.

The object of the present article is to provide still further, and possibly more substantial, evidence of the emulsifying properties of mustard than that referred to above.

Before describing the experiments it may be desirable to state a few facts about emulsions, for purposes of clearness.

Emulsion Types.

The fact that an emulsion of oil in water, such as the mayonnaise type, consists of globules of oil floating about, or dispersed, in water, is generally known to those who come in contact with emulsions. It is not always appreciated, however, that an emulsion can also take the form of globules of water dispersed in an oil. This type of emulsion is of the "*greasy*" type—*e.g.*, hydrated lanolin or wool fat—whereas the best-known emulsion type, such as cream or mayonnaise, may be referred to as "*creamy*."

It is interesting to consider why, in some cases, oil and water when shaken together give rise to a "creamy" emulsion, while in others, they form a "greasy" type. It is easy to differentiate between the two types. Thus, a drop of "creamy" emulsion added to water mixes readily with (or, more accurately, is diluted by) the water; whereas a drop of a "greasy" emulsion added to water behaves in the same way as a drop of oil—that is, it does not mix with the water. Further, as pointed out by Clayton,[1] the electrical conductivity of a "greasy" emulsion is decidedly less than that of a "creamy" one.

Emulsifying Agents.

The most important factor in determining emulsion type is the nature of the emulsifying agent or agents. The emulsifying agent is the substance present in the emulsion which wraps itself around the globules of the dispersed phase and prevents their aggregation and hence separation. The emulsifying agent has the effect of lowering the interfacial tension between the two phases or of increasing the viscosity of the system, or both. Certain emulsifying agents when added to an oil-water mixture favour the oil-dispersed-in-water, or "creamy," type of emulsion, while others favour the water-dispersed-in-oil, or "greasy," type. An example of the former type is sodium soap. If a mixture of vegetable oil and water containing sodium soap be shaken, a "creamy" emulsion results. If to this emulsion, drop by drop, a solution of lime water, or calcium chloride, be added, there comes a point at which the emulsion becomes very unstable. Further addition of lime water or calcium chloride, combined with shaking, results in the production of a "greasy" as distinct from a "creamy" emulsion. The reason for this is that the calcium compound reacts with the sodium soap to form calcium soap, which is insoluble in water. Calcium soap, unlike sodium soap, when shaken up with oil and water gives rise to a "greasy" and not "creamy" emulsion. The point referred to above at which the emulsion becomes unstable represents the "inversion" point of the emulsion—that is, the point

[1] *British Association Colloid Report* **2**, 114 (1918).

at which the effects of the sodium soap to produce a "creamy" emulsion are neutralised by those of the calcium soap to form a "greasy" emulsion. The result is instability.

Generally speaking, those emulsifying agents which are more readily wetted by water than by oil tend to form a "creamy" emulsion and *vice versa*.

Mustard as an Emulsifying Agent.

With this brief explanation it is convenient to refer to certain experiments showing how mustard can exert emulsifying properties. In the experiments equal quantities (6 c.c.) of saturated lime water and olive oil, respectively, were shaken together. The result is a "greasy" emulsion, or, in other words, an emulsion of water-dispersed-in-oil. Calcium soap, formed by the interaction of the lime water and the free fatty acids of the olive oil, is the emulsifying agent. The nature of this emulsion can be demonstrated either by microscopic means or by the methods referred to above. This mixture was taken as standard. In addition to the standard, mixtures of lime water were shaken with equal quantities of olive oil (6 c.c. of each) containing various quantities of mustard and the emulsion type determined.

The tables below show the types of emulsion which result:

TABLE I.

Weight of Mustard.	*Percentage Mustard.*	*Type of Emulsion.*
0·00 gm. fine mustard flour	0	Greasy (water-in-oil)
0·02 ,, ,, ,, ,,	0·17	,, ,,
0·04 ,, ,, ,, ,,	0·3	Unstable (mainly water-in-oil)
0·06 ,, ,, ,, ,,	0·5	,, ,, ,,
0·08 ,, ,, ,, ,,	0·7	,, ,, ,,
0·10 ,, ,, ,, ,,	0·8	,, ,, ,,
0·12 ,, ,, ,, ,,	1·0	,, (mixture of two types)
0·15 ,, ,, ,, ,,	1·25	,, ,, ,, ,,
0·20 ,, ,, ,, ,,	1·7	,, (mostly oil-in-water)
0·25 ,, ,, ,, ,,	2·1	Creamy (oil-in-water)
0·30 ,, ,, ,, ,,	2·5	,, ,,
0·40 ,, ,, ,, ,,	3·3	,, ,,
0·50 ,, ,, ,, ,,	4·2	,, ,,

TABLE II.

Weight of Mustard.	*Percentage Mustard.*	*Type of Emulsion.*
0·00 gr. coarse mustard flour	0	Greasy (water-in-oil)
0·05 ,, ,, ,, ,,	0·4	,, ,,
0·10 ,, ,, ,, ,,	0·8	,, ,,
0·15 ,, ,, ,, ,,	1·25	,, ,,
0·20 ,, ,, ,, ,,	1·7	,, ,,
0·30 ,, ,, ,, ,,	2·5	Unstable (Mixture of types)
0·40 ,, ,, ,, ,,	3·3	,, ,, ,,
0·70 ,, ,, ,, ,,	5·9	,, ,, ,,

It will be observed that mustard, when added to the lime water-oil mixture, exerts an effect similar to sodium soap, which is one of the most powerful emulsifying agents for vegetable oils—that is, the mustard antagonises the action of the calcium soap by tending to form a "creamy" emulsion, whereas the calcium soap tends to form a "greasy" emulsion. At a certain point—namely, in the case where a fine mustard flour was used (Table I.)—when the concentration of mustard in the aqueous phase reaches 2 per cent., the resulting emulsion is of the "creamy" type and not the "greasy." When it is realised that calcium soap is one of the strongest "greasy" emulsifying agents known, it is evident that mustard flour must also be classed as a strong emulsifying agent of the opposite type. In other words, mustard is a strong emulsifying agent in the direction of producing "creamy" emulsions.

Comparing Tables I. and II., it is evident that fine mustard flour is very much more effective than the coarse flour. This observation is what one would naturally expect in view of the results of Pickering,[2] who showed that in the case of fine powders which possessed emulsifying properties, the finer the powder the greater was the emulsifying effect.

The above experiment is of interest since, as far as the writer is aware, this is the first case on record in which an emulsifying agent in the form of a powder has been shown to exert an antagonistic effect towards another emulsifier of a colloidal character.

Application to Mayonnaise.

One of the most important applications of emulsifying qualities of mustard is to be found in the case of mayonnaise. Mayonnaise consists essentially of a "creamy" emulsion of vegetable oil in vinegar. The emulsifying agents present are egg yolk and mustard. Other substances are added for flavouring purposes, but as they do not materially effect stability, they are of no interest here. In order to be quite clear as to the emulsifying influences present in mayonnaise, it is desirable to state them. They are as follows:

(1) The lecithin (phosphatide) content of the egg yolk tends to produce a "creamy" emulsion and is a most powerful factor in the stability.

(2) The protein of the egg yolk exerts an influence in favour of a "creamy" emulsion.

(3) The cholesterol content of egg yolk tends to give a "greasy" emulsion—that is, it tends to make the mayonnaise unstable.

(4) Hardness of the water due to lime salts tends to give a "greasy" emulsion—*i.e.*, tends to make the product unstable.

(5 The mustard present has an emulsifying action in the direction of favouring a "creamy" emulsion.

(6) High oil content in mayonnaise is a factor which is against its stability as a "creamy" emulsion.

The accepted emulsifying agent of mayonnaise is undoubtedly egg yolk. It is obvious from the above that one cannot assume that all the constituents of egg yolk tend toward stability in mayonnaise. In fact, cholesterol has a definitely antagonistic effect in the sense that it favours a "greasy" emulsion and, therefore, tends towards instability in mayonnaise. Moreover, the relative amounts of lecithin and cholesterol in egg yolk have an important bearing on the emulsifying qualities of the egg yolk itself. Thus it would be interesting to know how the ratio of lecithin to cholesterol in fresh egg yolk compares with that in frozen egg yolk. It is a generally accepted fact that fresh egg yolk has better emulsifying

(*Continued on page* 20.)

[2] *J.C.S.I.*, **29**, 129 (1910).

NEW FOODS and DRUGS ACT

in the

U. S. A.

In view of the Departmental Committee in England which is at present considering the question of the desirability of altering the law so as to enable definitions or standards to be prescribed, it is interesting to have the following account of the new U.S.A. Food and Drugs Act presented to Congress, and which is expected to be enacted in the early part of this year.

RECENTLY THERE appeared in the U.S.A. a book entitled *One Hundred Million Guineapigs*. In the pages of this book the authors attempted to prove that the hundred million inhabitants of the U.S.A. were in effect human guineapigs, continually exposed to the experiments of manufacturers of foods, drugs, and cosmetics, frequently threatened by dangerous and harmful doses of poisonous ingredients knowingly or unknowingly included with various foods, drugs, or cosmetics.

Although somewhat exaggerated in their interpretation of the facts quoted, yet the authors revealed a number of distressing and even dangerous conditions in the U.S.A.—conditions which, in the opinion of the authors, were brought about largely by defects or omissions in the Foods and Drugs Acts.

Among various evils quoted by the authors were the recent cases of "ginger-jake" poisoning in various parts of the country; numerous cases of illness brought about by the use of old and deteriorated cans of ether for anæsthetic purposes; use of poisonous ingredients in tooth paste; numerous cases of poisonous and harmful ingredients in cosmetics; presence of excessive amounts of lead and arsenic spray residues on fruits and vegetables; numerous instances of false and misleading advertising claims for so-called health foods.

After reading this book the average citizen of the U.S.A. began to wonder how he had remained alive for such a long period! Nevertheless, there is some truth in much of the criticism voiced in this book. Drugs and cosmetics seem to be the worst offenders—particularly from the point of view of misleading advertising and the inclusion of dubious and at times dangerous ingredients.

Food manufacturers seem to show up pretty well at the present time. The chief criticism of food products is directed at the situation regarding lead and arsenic spray residues. Lead arsenate and other arsenic compounds have been used for many years as insecticides for apples and other fruits, and also for cabbages, celery, and other vegetables. The ban imposed by England on some apples from the U.S.A. some years ago focussed attention on the dangers attached to the use of these arsenical compounds, and demonstrated that man could not always rely on the forces of nature (chiefly rainfall) to remove spray residues.

As far as fruit is concerned the situation is fairly well in hand, following the adoption of washing in a dilute hydrochloric acid solution to remove the residue, although experience has shown that this acid wash is more effective in removing arsenic than lead. Some seizures of apple products, particularly apple pomace, were made last year because of excessive arsenic content, but the biggest difficulty at the present time is with celery, cabbage, cauliflower, and similar vegetables. Many seizures of shipments have been made, some containing arsenic many times in excess of the maximum tolerance of 0·01 gr. per lb. At the moment it is estimated that one-third of the appropriation for the Food and Drug Administration is expended in investigating the spray residue problem.

Objects of Act.

One of the objects of the new Foods and Drugs Act, presented to Congress by Senator Copeland, is to make the regulating work of the department easier, and to provide more funds for attacking this problem. It is anticipated that the new Act will be enacted some time in the early part of this year. Under the new Act cosmetics will be subjected to the same supervision as food and drugs. Advertising and promotional literature, especially of so-called health foods, will be supervised by the Department of Agriculture with the object of eliminating false and misleading claims, particularly those dealing with the health of the prospective purchaser. The Secretary of Agriculture will be empowered to promulgate definitions and standards for food products which will have the force and effect of law—at the present time such definitions as have been adopted only serve as a guide to officials and manufacturers and each definition is liable to be challenged in a court of law, although in actual practice the definitions are generally accepted. However, some manufacturers have managed to find loopholes in some of the definitions, by the use of trade names and other methods, and the new provision is expected to be of benefit in products such as jam, preserves, ice-cream, tomato products, and many others where a definite minimum percentage of fruit, fat, or some other ingredient is generally accepted as necessary for a first-quality article.

In addition, definite tolerances are to be set for added poisons in foods. Under the present law the Government is obliged to prove in each case that the product contaminated with a poisonous ingredient—*e.g.*, lead or arsenic spray residues—may be harmful to health, and frequently, of course, the dose obtained from a single sample may be comparatively harmless, but the cumulative effect may be serious.

A revision of the labelling requirements is also proposed, with the object of securing sufficient information on the main label of the package to enable a would-be purchaser to determine the exact quantity in the package, approximate composition of the product or ingredients used in its preparation, and grade or quality of the article.

In certain cases federal permits will be necessary to operate factories where a hazard to health is likely to be involved, and the new Bill also provides for voluntary inspection by the federal authorities, manufacturers taking advantage of this inspection being granted the privilege of an official emblem or statement they can use on packages.

Attitude of Manufacturers.

So far, food manufacturers have not expressed themselves very definitely on the proposed Bill. Few reputable manufacturers will object to the provisions regarding advertising, poisonous ingredients, and definitions or standards of quality. There is considerable criticism of the sections relating to labelling, which, it is claimed, will force speciality manufacturers to disclose their trade secrets, and also the section dealing with federal license and inspection schemes.

It is also considered that the Bill confers too much arbitrary power on the Secretary of Agriculture and his agents, and may lead to abuse of these powers in some cases by reason of the drastic provisions regarding the inspection of manufacturing plants and power of authorised inspectors to obtain copies of the records and transactions of the manufacturer and transportation agencies.

Professor Resford E. Tugwell, Assistant Secretary of Agriculture, is the leading proponent of the Bill, and his recent pronouncements leave no doubt that the major provisions of the Bill regarding supervision of advertising, misleading labels and packages, presence of poisonous ingredients, and provision of definite standards of quality will be retained.

The whole object of the Bill is to protect the consumer from dangerous or harmful foods, drugs, or cosmetics, and to make sure that he is not misled by false advertising or deceptive labelling. These objectives will be endorsed by all reputable manufacturers, but they will probably hope for some modification of the more radical provisions of the Bill regarding advertising, labelling, factory inspection, and availability of records when the congressional committees conduct hearings early this year.

EMULSIFICATION BY MUSTARD (continued from page 18).

qualities than frozen egg yolk, and this may well be due to a higher lecithin/cholesterol ratio in the former.[3] It is evident, therefore, in view of the possibilities of instability of mayonnaise, due to high oil content, hardness of water, variation of egg yolk, etc., that any factor which enhances the stability of mayonnaise is most important, particularly one which antagonises those emulsifying agents which tend to form "greasy" emulsions, such as hard water and cholesterol. The above experiments prove that mustard is not only useful for its condimental qualities in mayonnaise, but, in addition, it exerts a very valuable emulsifying effect and helps in the promotion of stability in mayonnaise.

The application of the above results has been proved in actual practice in experiments made in the writer's laboratory. Controlled experiments have been carried out with batches of mayonnaise made with and without mustard flour, with results shown below. The stability of the mayonnaise was measured by means of the Gardner mobilometer.[4] Batches of mayonnaise were prepared and periodically samples were tested in the mobilometer. If a batch withstood a hundred plunges using a 1,000 gm. weight it was regarded as stable; if it broke during the first hundred plunges its limit of stability had been reached. The relative stability of the batches of mayonnaise was measured by the number of days mayonnaise would stand before it would break within the first hundred plunges of the mobilometer.

[3] See J. W. Corran and W. C. M. Lewis, *Biochemical Journal*, **18**, 1364 (1924).

[4] See Gray and Southwick, *Food Industries*, **1**, 300 (1929).

TABLE III.

Formula.	*Age when Sample Broke in Mobilometer.*	*Number of Experiments.*
Mayonnaise : 3 per cent. frozen egg yolk. No mustard present	1 day, 1 day, 4 days	Three
Ditto—with mustard flour added with egg	31 days ; longer than 50 days	Two
Ditto—with mustard flour added with vinegar	24 days ; 24 days	Two
Mayonnaise with 12 per cent. frozen egg yolk. No mustard present	19 days	One
Ditto—with mustard flour added with egg	Longer than 30 days	One

The above table illustrates in a practical way the application of the results set out earlier in this article, and proves without doubt the value of mustard, not only as a flavouring agent, but also as an emulsifying agent. Incidentally, it is of interest to note that more emulsifying value is obtained by adding mustard to the egg and other ingredients prior to the addition of oil in mayonnaise manufacture, than by adding it with the vinegar in the last stage of the process.

There are points of special interest to the British Canner in the following article.

The Golden State has had a somewhat hectic peach-canning season, but for once the industry has been controlled in its own interest, and the recent spirit of cut-throat price competition has been curbed. The grower has been given a fair price for his fruit, and labour an increased return for its services.

There has been some dissatisfaction, but on the whole the plan has been very successful.

The industry is hoping that it does not return to the unhappy days of 1932, and that this year's programme marks a permanent step forward.

The California Peach Season of 1933

By Professor W. V. Cruess

Fruit Products Laboratory, University of California.

AT THE present writing, the last week of September, the canning of cling stone peaches in California is practically completed. It has been an unusual season for the grower and canner of cling peaches, as this is the only Californian fruit to come under the industry control plan of the Agricultural Adjustment Act of May 12, 1933.

As most readers of FOOD MANUFACTURE know, the industries of U.S.A. are being brought under the provisions of the N.I.R.A. (National Industrial Recovery Act) or the A.A.A. (Agricultural Adjustment Act) as part of President Roosevelt's new deal.

At the annual meeting of the Canners' League of California late in the spring of this year tentative plans for organising the canning industry under the N.I.R.A. were discussed. Shortly thereafter many days of conferences ensued between representatives of the California Canners' League, A. D. Poggetto, manager of the California Canning Peach Growers' Association, Dr. H. R. Wellman, of the College of Agriculture of the University of California, Alex Johnson, of the Farm Bureau Federation, and others. A plan was drawn up under the A.A.A., but at telegraphic request from Washington, D.C., was redrawn under the N.I.R.A. A short time later, however, at the request of the Government the plan was transferred to the A.A.A., under whose supervision it remains. The majority of the canners approved, and Preston McKinney presented it in Washington. In addition to his other duties, Mr. McKinney is secretary of the Canners' League of California. The Peach Growers' Association gave permission to proceed—with several reservations, among them the right to protest later at the formal hearing.

The main purposes of the plan were to limit production, establish a fair price to the growers, a fair and stable price for canned peaches, and to give labour a fair deal. A code governing general trade practices was also involved. The pack limit first established was 9,500,000 cases, or the equivalent of about 207,000 tons of No. 1 peaches. Later the limit was finally established at 10,000,000 cases, or 218,000 tons.

Professor H. R. Tolley, Director of the Giannini Foundation of the College of Agriculture of the University of California, was selected by the Secretary of Agriculture to administer the provisions of the A.A.A. to special crops such as fruits, etc., as distinguished from the administration of the major crops, such as wheat, corn, and cotton, these being under the supervision of other representatives of the Department.

In the daily press under date of August 12, 1933, the following news note appeared:

> "The Farm Administration was informed that more than 73 per cent. of the California cling peach industry had accepted the proposed marketing agreement written recently by the Farm Administration officials. An agreement had previously been offered by growers and canners in the California peach industry, but after they failed to come together the Farm Administration redrafted their proposal and sent it to the canners for acceptance."

By that date the peach canning season was well under way upon midsummer varieties. However, time re-

Delivering Peaches to the Cannery.

mained for putting the plan into effect for the major portion of the season.

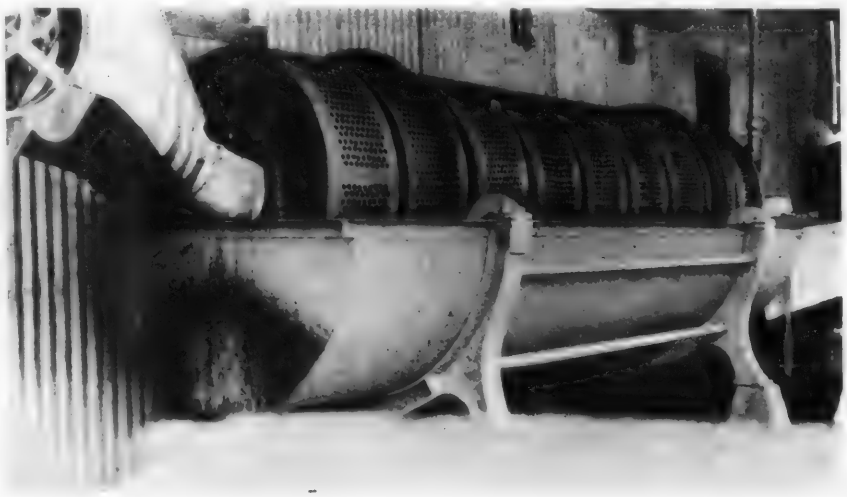
The principal provisions of the agreement are briefly as follows:

1. A general control committee of ten members was selected. On this committee the general public, the canners, and the growers were represented. The committee selected as managing agent Preston McKinney.

2. A crop estimating committee was selected, on which were representatives of the Farm Bureau, the Canning Peach Association, the Canners' League, and the independent canners. This committee surveyed the crop on the trees and brought in an estimate of the total tonnage of No. 1 peaches available for canning. Their estimate was considerably above the limit previously agreed upon for the season's pack—namely, 10,000,000 cases (218,000 tons).

3. This estimate made necessary the function of the third committee—namely, the Allocation Committee, consisting of F. J. Koster, R. N. Wilson, and Alex Johnson. Canners gave this committee their requests for the number of cases each desired to pack. The total requested came to about 15,180,000 cases. This made it necessary to scale down the requests markedly in order to come within the agreed 10,000,000 cases. As might be expected, considerable protest from some canners arose because of alleged discrimination. On the whole the allotments were accepted in good grace. Canners were permitted under the code to appeal to the Secretary of Agriculture. This a number did, and their appeals were adjudged by Dr. Tolley. He granted some increases in allotments, although such increases made it necessary correspondingly to reduce the allotments of other canners. The total amount thus involved was about 300,000 cases. The allocations were based upon previous sales record of the cannery, demonstrated potential sales ability, and outstanding contracts for canned peaches.

4. The grower was to receive $20·00 a ton for all No. 1 fruit delivered to cannery or to nearest shipping point. The canners were to pay an additional $2·50 a ton for all fruit canned into a fund from which the growers were to be paid $15·00 a ton for all unpicked fruit of No. 1 grade. The control committee has power to increase this assessment to above $2·50 a ton if such increase is found



Washer for Removing Lye from Lye-Peeled Peaches.

necessary. This assessment of $2·50 a ton for the cannery's entire allotment was due on or before September 15, 1933. Any excess after final settlement for the surplus is to be returned to the grower.

5. No. 1 cling peaches were defined as being 2⅜ inches or more in diameter; suitable for canning; of good shape, colour, texture, and quality; free from worms, scab, hail or rain damage, red streaks in flesh, windfalls, split pits, parasites, fungi, and other imperfections. No. 2 peaches are suitable for canning but below 2⅜ inches in diameter.

6. "One ton of No. 1 peaches" means the quantity to yield forty-six cases of No. 2½ cans of cling peaches.

7. The surplus crop of No. 1 peaches left on the trees is to be estimated by representatives of the control committee, and each grower concerned is then paid at the rate of $15·00 a ton for such fruit. The grower has the right of appeal.

8. Prices were set for canned peaches f.o.b. San Francisco, of which the following prices are typical:

Item.	*Maximum per Dozen cans.*	*Minimum per Dozen cans.*
	$	$
No. 2½ choice	1·55	1·30
No. 2½ standard	1·35	1·20
No. 2½ seconds	1·25	1·10
No. 2½ water	1·20	1·05
No. 2 choice	1·20	1·05
No. 1 choice	·95	·85
No. 10 choice	5·10	4·35

For export the above prices also prevail, except that allowance shall be made for "drawbacks" on sugar and tinplate, and a 2 per cent. discount for cash.

The Secretary of Agriculture may change these prices if conditions make such change advisable.

9. The canners' books are subject to examination by the Secretary of Agriculture's authorized representative; all such information to be held confidential.

10. Violations are to be reported to the Secretary of Agriculture, who can cancel the canner's licence obtained under the code.

It was a herculean task to frame and put into effect the peach code or peach control plan, and it is a tribute to those in command that it has gone forward with relatively little trouble to date.

There have been a few apparent violations, of course, as would be expected, but these are being "ironed out" speedily and justice will be done.

The pack has been limited to approximately 10,000,000 cases; that was the main objective, and it has been attained. The carry over from last year is small, and it should not be a difficult task to move this season's pack at the fair prices agreed upon in the code. Dr. Wellman points out that at $1·30 a dozen for choice canned peaches the canner is making little or no profit. He estimated the cost at $1·34 for 1932.

The grower receives a living price for his fruit, $20·00 a ton, contrasted with only $6·50 a ton for the same fruit last season under the demoralised markets of that period. Also last year much of the crop remained unharvested, and for this fruit the grower received no money at all.

Labour has received a considerable increase in wages. The minimum rate per hour for male labour was set at 27½ cents; the rate last year in many canneries was only 20 cents an hour. Woman labour is used in cutting, pitting and canning, etc. Labourers in the orchards employed by farmers did not come under the provision of the code. Consequently, they became dissatisfied with their income of 15 cents to 20 cents per hour and struck for higher wages. At one time several thousand were on strike and considerable disorder occurred. However, wages were raised to about 25 cents per hour, and most of the strikers returned to work before the crop was seriously endangered.

Mechanical Pitting.—Aside from the foregoing economic considerations, progress can be reported in mechanical pitting of cling stone peaches. Two types of

Scales and Bucket used by Inspector for Weighing Culls at Shipping Point.

pitters are in use—namely, the A and B Pitter and the Federal Pitter. Both have given satisfaction, and with further improvement in design will undoubtedly be even more generally used. It is claimed that not only is labour saved, but also that there is an increased yield and improved quality.

Canned Cocktail.—A considerable quantity of peaches has been used this year in canned fruit cocktail, a mixture of various diced fruits for use in desserts, salads, cocktails, etc. Peaches so used are not included in the 10,000,000-case quota. This product was first developed at the University of California in the fruit products laboratory, and has gradually gained favour with certain canners.

FOOD COLOURS

Should the Law be Changed?

Some arguments in favour of a Prohibited List and also of a Permitted List were presented last month. Readers were invited to contribute their views. We give below a selection of these.

T. H. Fairbrother M.Sc., F.I.C.

IF ARTIFICIAL colouring matters are to be used at all in foodstuffs, and it seems inevitable that they always will be, I am strongly in favour of a Permitted List, and a heavily restricted one at that. The Permitted List in America is far too big, and all required colours could be easily obtained from a smaller number of primary colours by judicious blending.

I would prohibit the sale of colours for foodstuffs by any who did not hold a licence from the Ministry of Health, who would have powers to inspect the factories and laboratories of the manufacturers at any time and take samples to satisfy themselves as to purity.

All colours for foods issued to food manufacturers should be sent out in glass bottles, sealed with the seal of the issuing and testing laboratory, and accompanied by an analytical certificate signed by a responsible and qualified analyst. Stocks should be kept accurately and returns of sales and destination should be made.

In my opinion, the existing law in England is absurd. To prohibit only picric acid, Victoria yellow, Manchester yellow, aurantia, aurine, and gamboge out of all the legion of dyes enumerated in the Colour Index is Gilbertian in its farcicality. Instead of allowing people to use any dye, whether it is toxic or not, the Ministry of Health should prescribe a short list of colours whose toxicity and therapeutic properties have been worked out.

Some years ago, in conjunction with Renshaw of Manchester, I carried out an extensive investigation of the antiseptic properties of a large number of very highly purified dyes, and this work revealed the fact that some dyes, though containing no arsenic, lead, or zinc and not being in the prohibited half-dozen, were definitely toxic, and yet there is nothing to prevent a food manufacturer using any of these. If a few dyes were selected and their physiological action thoroughly studied and their non-toxicity established, then the position would, in my view, be much clearer.

Public Analyst.

Since the first remarks included in your last issue were, I believe, made by myself, it would be unwise for me to attempt to criticise them now, but there are several points raised in the later comments which certainly call for discussion.

When the Select Committee was sitting on the matter of preservatives and colours, it was concerned rather with the former than the latter, but in each instance the idea was to leave the law in as elastic a state as possible with a view to a complete revision of the whole of the food and drug administration. Very little evidence of a physiological nature was submitted to the Committee, and what was offered was contradictory.

At the present time a considerable amount of research is required before one can state what is and what is not harmful to the human organism. It is now being recognised that many of the animal experiments that have been carried out on vitamins are not entirely reliable for man, owing to the difference in the constitution of the two types of experimental animal, man and, say, rat, guinea-pig, etc. It must be remembered, however, that certain chemical groups are known to be responsible for causing dermatitis, others are apt to affect workers adversely, and by prohibiting dyes containing these groups a certain amount of safety will be assured. To do this effectively will not mean, as some might think, merely lengthening the present Prohibited List; it would make an enormous Prohibited List. Therefore, in my opinion, it would be simpler to construct a Permitted List at once, and, if this is sufficiently elastic, it could contain sufficient dyes for all ordinary purposes.

With regard to allowing all dyestuffs at present in use and forbidding the introduction of others, I would ask your correspondent how he would collect the names of all dyes at present in use. So far as my knowledge goes, they are not even known by the manufacturers themselves, and it must be admitted that this is a most unsatisfactory state of affairs. In any case it would be a simple matter for foreign manufacturers to claim that they had only employed a dye that had been in use previously. It would be placing an embargo on British manufacture to the advantage of the foreigner.

By all means any Permitted or Prohibited List should be drawn up with a full consideration of other lists. One must at all times endeavour not to upset or destroy inter-

national trade, but, unless regulations are made carefully, this is inevitably done.

My experience leads me to believe that colour manufacturers worry less about the physiological effect of their colours than does the food manufacturer, and with this disadvantage, that many colour suppliers refuse to give the food manufacturer any information as to the composition of their colours in case the latter may go to another supplier at some other time to obtain a cheaper product.

Surely it would be more difficult to remove a colour from a Prohibited List or to add to a Prohibited List than to add to a Permitted List, because in the latter case the list could be made flexible, whereas the Prohibited List could not be altered so easily. In Germany a Government department is enabled to allow new preservatives or colours to be used if it is persuaded that they are satisfactory; the same system could be introduced here.

With regard to the argument that only colours definitely known to be noxious should be prohibited, this would appear to be an argument in favour of shutting the prison door after the escape of the prisoner. Most of the arguments against any particular dye must be presumptive rather than definite, and it will probably always be so. The more we learn of nutrition the more we realise that our knowledge is negligible.

A Permitted List does not for one moment assume that all others are toxic; it merely assumes that the permitted ones are believed to be safe. Can your correspondent give a list of all dyes which are known to be non-toxic? Can he even give a list of the majority of dyes employed in the food industry? I doubt it.

A Permitted List can be sufficiently large to allow any necessary colours required for any changes taking place in manufacture, hence my previous statement that a Permitted List causes a public analyst more work than a Prohibited one. In the event of it being decided to institute a Permitted List, manufacturers should be invited to submit the names of any colours which they wish to be included. Colours would then be selected by an expert committee from the various lists so that no real hardship need be inflicted on anyone.

Possibly it is a pity that manufacturers do not suffer any anxiety as to the wholesomeness of their colours, in view of the frequent ignorance of those which they are using. This argument will not stand investigation for a moment.

Another Public Analyst.

On the question of food colours and the law regulating their use, I beg to make the following observations:

The law, if and when it is amended, should operate to reduce the enormous amount of colouring matter that must at present be used in articles of food. I am aware that this may appear an unpopular and possibly retrograde policy, but it seems to me that the food faking complex, to some extent thwarted in the matter of preservatives, is seeking outlet in an orgy of either dyeing or bleaching. While it is easy to become faddy and exaggerate the harmful effects of such chemicals as boric acid, formaldehyde, sulphur dioxide, Manchester yellow, and all the gamut of aniline dyes, they are all surely unnatural and unnecessary as integral ingredients in our daily foodstuffs.

Our bread, for instance, is bleached, but the butter on it is dyed. White sugar is bleached or dyed blue to appear bleached. Coffee beans are dyed and command a higher price thereby. Kippers are partially smoked but completely dyed. Haddock fillets are practically painted. The jam with which we round off this highly chromatic breakfast is made of well-bleached sugar, glucose, and pulp, and is finally dyed.

I might have added that the pepper condiment applied to the kippers was, no doubt, first bleached and then redyed to a suitably acceptable shade.

Much the same tale might be told by working through another meal. As an instance: whether we make our pudding of bleached sultanas or dyed cherries, we may be sure that the flour composing the crust probably got a chlorine bleach at one part of its career, and therefore demands a well-dyed yellow custard sauce as its final partner.

When one thinks about it, what could be more unappetising than blue peas or even bright green peas out of a tin? Certainly not the pale, but obviously unadulterated, article that one would get without the use of green dye; and yet, I imagine, a mint of money has been spent, and is being spent, on producing a suitable stain for tinned peas.

Well, sir, the public get what they demand ultimately, and obviously many million meals are going to be dyed or bleached before we learn sense.

If, then, we tolerate the principle of trying to make our food look appetising by artificial means, let us at least do it gracefully and with a minimum of restrictions. In other words, let us stick to our present system and, as one of your contributors has already said, assume a colour is innocent until proved guilty.

It appears to me that, if one bears in mind all aspects of the question, many of your arguments for the two policies of "prohibiting" or "permitting" cut both ways. For instance, the fact that a certain policy has been followed for a number of years may be taken as a sufficient reason for now making a change in accordance with more up-to-date ideas. The success of the 1914 British Pharmacopœia was not seriously questioned, but the 1932 version is a great improvement.

With regard to the economics of the question, any change that makes for obsolescence may be considered beneficial in these days of high production and under consumption.

From the point of view of the public analyst, the desirability of having more work or less work depends entirely on individual circumstances. This aspect, however, is comparatively unimportant.

The chief consideration should surely be the health of consumers, and from this point of view, as I have already said, why have so much colour matter at all? The yellowness of butter should be an indication of its natural vitamin content, not a sign of the cleverness of colour producers.

A Brittany Sardine Fishing Centre.

FISH CANNING

The following account of the French method of canning sardines is taken from "The French Sardine Industry," by Hugh M. Smith, published in a bulletin of the United States Fish Commission for 1901.

WHEN THE fish are taken to the factory they are spread on large tables and sprinkled with a little salt. The women who remove the heads and viscera either stand or sit, and perform their work with great rapidity. They hold the fish in the left hand and with the right hand press the knife into the back and side of the head of the fish, using the right thumb for a counter-pressure. The head is pulled or torn off, rather than cut, and the œsophagus, stomach, and most of the intestines go with it. The body drops into one basket, the refuse parts into another. The refuse is disposed of to farmers for fertilising their fields.

Brining.

Immediately after evisceration, the fish are sorted by size into large tubs (half oil barrels holding 250 litres) containing a brine strong enough to float a potato. Here they are left for half an hour to an hour, depending on their size, quality, and the condition of the weather. They are then placed in small wicker baskets and taken to the yard, where they are washed in either fresh or salt water (salt preferred) while in the baskets, each basket being put through two waters. This washing, which takes but a few seconds, removes from the fish any undissolved salt, loose scales, and dirt.

Drying.

Drying, which is the next step, is preferably done in the open air, and a large part of the product is so treated. For open-air drying the fish are arranged by hand, one by one, in wire baskets or trays holding about 150 fish of medium size, placed on wooden frames or flakes. The baskets are 16 or 18 in. long, 9 in. wide, and 3½ in. deep, are made of coarse wire with a polygonal mesh two-thirds or three-fourths inch in diameter, and have a long bridle-like wire handle on each side by which they are suspended on the flakes, each bridle having at its middle a loop or ring which interlocks with its fellow. The distinctive feature of this wire tray is its division into about seven crosswise compartments, **V**-shaped in section, the spaces being pointed at the bottom and open above. The divisions are of coarse wire, and one side of the **V** forms a wider angle with the basket bottom than the other. Against the more oblique side the sardines are placed in regular rows, with their tails upward, so as to promote the escape of water from the abdominal cavity. By means of the loop in the handle some of the baskets are hung on the frames, somewhat above the head; others are rested on lower frames. Wooden baskets or trays are used in some places.

The sardines remain out for a variable time, depending on their size, the state of the atmosphere, etc. The usual time in favourable weather is one hour.

In damp, foggy, or rainy weather (especially in autumn), the sardines must be dried indoors by artificial heat, and drying ensues much sooner than in the open air. Some factories, not being provided with driers, are unable to operate in such weather. In most of the fac-

tories—especially those more recently constructed—artificial heat is supplied in a special drying chamber by means of steam pipes, but in some of the older canneries the wire baskets are suspended from a wire lattice under which are small charcoal furnaces.

Cooking.

From the drying flakes the fish are taken in the same wire baskets to the cooking room and immersed in boiling oil in open vats of various sizes and construction. As the fish are quite dry, much of the oil is taken up in cooking and has to be replaced from time to time by fresh oil. The immersion in oil usually lasts about two minutes, but depends on the size of the fish, and is best gauged by experience. When the caudal fin will break easily the fish are said to be cooked enough.

The baskets are then removed to a table or platform with an inclined metal top, where the surplus oil is allowed to drain from the fish. After a few minutes the baskets are taken to the packing room, where they are hung on wooden frames over metal-top tables for further draining and cooling. The oil which drips off here is in some places used in soap making.

The sardine manufacturers employ two kinds of oil in their canning operations—olive oil and arachide or peanut oil, and small quantities of sesame oil have at times been used.

Packing.

There are various ingredients with which or in which the sardines are packed to give them flavour or piquancy. Some of the very best goods are prepared with melted butter of good quality instead of oil; these are mostly for special French trade. Tomato sauce, pickles, and truffles are also used. With all of these the sardines are packed precisely as when oil is employed and in cans of the same sizes. Only relatively small quantities of such goods are prepared.

When the fish reach the packing room the women who had been cutting will probably have finished that task and are seated at a table ready to take up the packing of the sardines in tin boxes; they carefully place the fish in the cans, and then pass them along to another set of women who fill the boxes with oil from a faucet or with other materials used with the sardines—tomato sauce, mustard, truffles, etc.

With most of the oil sardines a small quantity of spices is used in order to impart a flavour. The usual ingredients for each can are one or two cloves, quarter or half of a laurel leaf, and a small piece of thyme; these are put in the can before the fish so that they will be on top when the can is opened. The fresh leaves of tarragon (estragon) are sometimes used.

Closing.

Sealing the bottoms on the cans—the next step in the preserving process—is one of the few things done by men. Soldering appliances of various types are used in the different factories. The most convenient, time-saving, and modern soldering iron would appear to be that which is kept constantly heated by gas.

Processing.

From the soldering table the cans are taken to another room in which they are placed in large square iron vessels, open at the top and holding several thousand "quart" cans. The vessels are then immersed in boiling water for two hours.

After cooling, the cans are placed in dry sawdust and stirred from time to time; this absorbs the oil and moisture on the surface and renders the cans clean and ready for packing.

There is a comparatively small proportion of the fish prepared as "boneless sardines," which are rendered "boneless" by bending the caudal peduncle until the backbone breaks, and then drawing out the vertebral column with special tweezers or pincers. Fish intended for this purpose require more prolonged drying (2 to 3 hours), so that the muscular tissue may separate more completely from the vertebræ. Only fish 60 mm. long or over are made "boneless," and of even the larger fish only a small quantity is so treated. The best sardines are not so prepared, as they are fresher when they reach the cooking room, having required only one-half or one-third the time for preparation up to that stage. The "boneless" fish, while undergoing the additional drying, are deteriorating. The removal of the backbone adds about 6 per cent. to the value of the fish, although the women who prepare them receive no additional wages.

Most of the canning factories receive their cans ready made, but some simply have the separate parts cut and

Belle Ile Harbour, Brittany.

(By courtesy of Paris-Orléans and Midi Railways of France.)

during winter give employment to the can makers. Nearly all of the sardine cans are now provided with keys, which are placed on the cans as the sardines are boxed for market. The sardines of the best quality have keys for use on the side or edge of the can, rather than on the top, which remove a thin strip of tin.

Labelling of French sardines is an important branch of the canning business, and although the use of labels is not required by French law, labelling is almost invariably practised. The most popular and generally employed label is that which is stamped on the tin. Very few paper labels are used, and these are chiefly for special French trade. Some of the best grades of sardines are labelled with brass labels of oval or oblong shape, attached to the side of the cans by solder.

CEREAL CHEMISTRY

(*Continued from page 9.*)

be worse off. As far as home-grown wheat is concerned this review must, therefore, end in a pessimistic vein—but who can foretell the future? There is much talk of food standards which may affect cereal chemistry considerably. A few years may see the prohibition of bleaching and improving by chemical means, definite limits of flour extraction may be set up, wheat prices may be dictated by chemical analyses, and the sales of offals decided by fibre content. These things and more may happen, but "à chaque jour sa peine."

[*Photographs illustrating this article are reproduced by kind permission of the High Commissioner for Canada.*]

JAM STANDARDS

MR. S. CRAIG BAIN, President of the South African Food Canning Council, has sent us the following interesting comparison between the British standards for first quality jams approved by the Food Manufacturers' Federation and the National Mark Standards. We will leave it to readers to make their comments upon this.

Variety of Preserve.	F.M.F. Standards (1st Quality).			National Mark Standards.		
	Minimum Quantity of Fruit Used per 100 lb. of Finished Preserve.	*Quantity of Sugar Used per 100 lb. of Finished Preserve.*	*Weight of Fruit Used to 50 lb. Sugar (to nearest lb.).*	*Minimum Quantity of Fruit Used per 100 lb. of Finished Preserve.*	*Quantity of Sugar Used per 100 lb. of Finished Preserve.*	*Weight of Fruit Used to 50 lb. Sugar (to nearest lb.).*
	A.	*B.*	*C.*	*A'.*	*B'.*	*C'.*
Strawberry	42	64·7	32	55	63·5	43
Raspberry	38	65·5	29	50	64·5	39
Black Currant	30	64·2	23	40	62·8	32
Red Currant	35	64·9	27	45	63·9	35
Green Gooseberry	35	—	—	45	—	—
Red Gooseberry	40	—	—	50	—	—
Greengage	40	62·9 x	32 x	50	61·5 x	40 x
Victoria Plum	40	63·5 x	31 x	50	62·2 x	40 x
Green or Golden Plum ...	35	64·7 x	27 x	45	63·6 x	35 x
Red Plum	40	63·3 x	32 x	50	62·0 x	40 x
Damson	38	62·4 x	30 x	50	60·5 x	41 x
Blackberry	38	65·0	29	50	64·0	39
Cherry	45	62·9 x	36 x	55	61·7 x	45 x
Loganberry	38	—	—	50	—	—
Apricot	40	—	—	—	—	—
Peach	40	—	—	—	—	—
Rhubarb	45	—	—	—	—	—

Columns A A' are taken from the published standards.

Columns B B' are figures calculated from the standard minimum weights of fruit per 100 lb. finished preserve, taking the preserve to contain 68·5 per cent. soluble solids and using the average soluble solids content for each variety of fruit as given by Macara.

Columns C C' are calculated from *A* and *B*, *A'* and *B'* respectively.

With figures marked (x) no allowance has been made for the weight of stone (or pits) in the fruit (data not being available).

CHERRY PRODUCTS

These articles describe processes for preparing glacé, candied, crystallised and maraschino cherries

Part III.

IT WAS our intention to deal with the preparation of maraschino cherries, but the following communication from a Canadian reader has raised the question of colouring:

"I have read with interest the article on Preparing Glacé Cherries in your issue of September, 1932, regarding the manufacture of glacéd cherries in Europe, and also the letters dealing with this subject from New Zealand in later issues. There are, however, a few points on which I would still like to have further information.

In the first place, I understand that most of the French cherries imported into Canada are coloured with erythrosine dye. I have used this dye to some extent, but find it quite cumbersome to use in comparison with dyes such as Ponceau and Amaranth, which can be added directly to the syrups. If the French have an easy way of introducing erythrosine dye into their fruit, I would certainly like to know about it. The process followed here has been to add the dye to water which was made alkaline with bicarbonate of soda. This was applied hot to the cherries and the dye solution heated every day until the cherries were sufficiently coloured. The dye solution was then removed and a solution of citric acid applied to the fruit which set the dye. These two operations occupied about a week's time, and during this period I noticed that several of the fruits softened. The advantage of using erythrosine lies in the facts that it can be set so as to prevent 'bleeding' in the glacéd cherry and that it develops an attractive colour which does not deteriorate with age.

Ponceau, as suggested in Mr. Elsbury's article, will bleed into the cake unless the cherries are absolutely dry. I do not believe there is any way of setting Ponceau dye, and, accordingly, if it is to be used, I would be interested in means of drying the fruit to the point where there is practically no syrup left. We have used a prune dehydrator at this station, in which case we placed oiled paper on large trays and then placed the smaller trays containing the glacéd cherries immediately above. A large tray covered with paper and carrying two small trays of cherries was alternated to build the stack. By using oiled paper we prevented the drip from one tray to another and thus shortened the drying time for the lower trays. If there is a commercial plan for a dehydrator which achieves this result, I would certainly appreciate hearing of it.

The strongest syrup used in glacéing cherries here has been 75 per cent. This syrup, after repeated boilings, has begun to caramelise slightly. Can this burnt flavour and colour be removed by the addition of an activated charcoal before filtering?"

For the present we prefer to reserve our opinions on the points raised in the above communication. It will, however, be interesting to submit a résumé of the views held by other authorities on this question of colouring.

As regards the last paragraph, it would appear that the best way of overcoming the discoloration trouble is to employ a method of concentrating the syrup under vacuum. Plant is now available for carrying out this operation in connection with the candying of peel and is, of course, applicable for cherry work.

As regards the softening of the fruit, some useful hints may be gathered from the remarks made in Part I. of this series on hardening agents and from the information given below.

The system of drying devised by our correspondent should work quite well, provided that provision is made for passing a warm current of air over the trays in such a manner that a uniformly distributed circulation of this air is ensured. A certain portion of the air, determined by trial, would be recirculated. During the total drying period, this proportion would be varied in such a way as to subject the fruit to conditions of diminishing humidity; the rate of diminution can only be found out by trial and depends on what the fruit will stand without suffering in respect of appearance and texture.

It has already been mentioned that cherries may be coloured before or during syruping operations. Bullis and Wiegand, of the Oregon Experiment Station, spent two years in experimenting with various methods for the blanching and dyeing of maraschino cherries. The advice they give is to colour the fruit after it has been freed from SO_2 by leaching in running water in order to reduce the preservative to the permissible amount and *to remove*

salts that tend to soften the fruit when boiled in the dye solution. In the process which they developed, Bullis and Wiegand used a solution of 1½ oz. of erythrosine dissolved in 12 gal. of water, to which is added from ½ to 1 lb. of bicarbonate of soda for each 100 lb. of fruit. The depth of colour is to some extent controlled by the amount of dye used and the time the fruit remains in the dye solution. To set the dye properly, about ¾ to 1¼ lb. of citric acid is added to each 12 gal. of solution.

Much the same advice is given by E. L. Densmore in conection with the dyeing of cherries for fruit salad in such a manner that the colour will not stain the syrup or the other fruit. For each 100 lb. of cherries and 12 gal. of water, Densmore uses 1½ oz. of erythrosine and ½ lb. of bicarbonate of soda. The fruit is heated in this solution for 15 minutes to 205° F. and then allowed to stand until the desired colour is obtained. At this point 1½ lb. of a 50 per cent. solution of citric acid are added and the whole allowed to stand for 24 hours in order to set the colour in the fruit.

However, for the dyeing of maraschino type cherries, Densmore dissolves ½ oz. of certified 91½ per cent. No. 80 Ponceau 3 R to 8 gal. in water. In this solution 100 lb. of pitted cherries are placed and the whole heated to 205° F. for 15 minutes. After allowing the fruit to stand in the solution for a few hours until the temperature has fallen to 70° F., the liquid is drawn off preparatory to syruping operations.

S. Blumenthal, of the Shirley Laboratories, New York, recommends dissolving 4 oz. of Ponceau 3 R in a gallon of warm water. He says that 20 oz. of this solution are sufficient to dye 300 lb. of fruit. If the solution is kept warm the cherries will be uniformly tinted in about 2 days; on the other hand, if a cold solution is used the time required may be from 4 to 7 days.

H. B. C.

HONEY

Research being carried out in the U.S.A.

GERTLER and Lothrop in America have recently studied the relationship between the viscosity and chemical composition of honey.

Although viscosity (body) of honey depends primarily on temperature and concentration of solids, variations that occur in the chemical composition of honeys from different floral sources have a pronounced influence on viscosity. It is found that the so-called honey "dextrins" increase the viscosity, so that honeys containing relatively large quantities of these "dextrins" (honey-dew types) are more viscous than relatively pure floral types at the same solids concentration. Colloidal matter and the relative proportions of dextrose and levulose also influence the viscosity. The quantity of inorganic salts present is probably too small to have any significant influence. Practically all honeys are distinctly more viscous than solutions of sugar mixtures of corresponding composition and concentration.

Students with one of their Excellent Displays at the Annual Exhibition of the National School of Bakery, Borough Polytechnic, London.

South African Pineapples arriving at the Cannery.

Mr. Morison reviews the present position of the South African fruit canning industry. This is of special interest in view of the new standards for the packing, preparation, and grading of South African canned fruits proposed by the South African Food Canners' Council, details of which were published in "Food Industries Weekly" on December 15 last.

CANNING in SOUTH AFRICA

By John Morison

General Manager,
South African Food Canners' Council.

THE FRUIT-GROWING industry in the Union dates back to the early occupation of the Cape Province, but it was not until the year 1892 that the commercial growing of fruit was established as the result of the vision and forethought of the late Cecil Rhodes, the late John X. Merriman, Messrs. Fred Struben, L. M. Dicey, H. E. V. Pickstone, R. P. Malleson, and Percy Molteno.

With the development of the fruit industry, domestic consumption could not keep pace with production, and it was found necessary to build up an export market in both fresh and processed fruit.

To-day South Africa exports fresh deciduous and citrus fruits to the value of about two million pounds a year, to the United Kingdom, Canada, South America, Sweden, and other European countries.

Fruit-growing is carried out in the Cape, Natal, Transvaal, and Orange Free State Provinces, the area under orchard being over 11,000 morgen, on which 17,000,000 fruit trees have been planted.

The South African canning industry over the past thirteen years has made considerable progress in relation to production, domestic consumption, and the building up of an export trade. Factories are now established at Port Elizabeth, Durban, Rustenburg, Salt River, South Coast Junction, Zuider Paarl, Groot Drakenstein, and Wellington.

The industry, although more or less in its infancy, is a most important one from a national point of view, seeing that it employs, in conjunction with jam manufacturing operations, 2,700 employees; pays annually £120,000 in wages; in the process of preserving uses 7,800 tons of South African sugar, 14,000 tons of fruit, and other material to the value of £140,000; the industry also pays in ocean and rail freights £67,000 a year, and has an output valued at £550,000 a year.

The progress of the industry may be gauged by the following figures:

Year.	*Production.*	*Exports.*	*Per Capita Consumption Based on European Population.*
	(*Lbs.*)	(*Lbs.*)	(*Lbs.*)
1920-21 ..	2,693,541	1,436,674	1·19
1921-22 ..	4,669,795	1,700,402	2·01
1922-23 ..	4,721,288	1,776,589	1·87
1923-24 ..	4,683,309	3,553,951	1·28
1924-25 ..	5,441,380	3,166,730	1·35
1925-26 ..	8,306,951	3,326,591	3·07
1926-27 ..	4,380,546	3,522,238	·74
1927-28 ..	6,515,076	2,945,138	2·13

Fruit for Export at Orchard Siding.

1928-29 ..	7,604,270	3,569,536	2·77
1929-30 ..	7,670,954	4,450,902	2·30
1930-31 ..	6,655,095	1,661,728	3·15
1931-32 ..	11,541,735	3,778,110	4·42
1932-33 ..	12,941,855	4,119,110 (To 30/9/33)	4·91

The varieties of fruit processed are apricots, peaches, pears, pineapples, fruit salad, golden berries, grapefruit, guavas, quinces, and granadillas, the principal varieties being apricots, pears, pineapples, and peaches.

The industry has now reached a stage when further development is economically impossible unless a satisfactory outlet is obtained for its surplus production. At the present time nearly 95 per cent. of Britain's canned pineapple is drawn from Empire countries, but only 14 per cent. of her imports of apricots, peaches, pears, fruit salad, grapefruit, etc., are of Empire origin. This is a striking illustration of the demand that exists for varieties of fruit which could to some extent be supplied from South Africa.

The canners of the Union are anxious to extend their export trade with Great Britain, but they are forced to pay due regard to the basic and fundamental principle underlying the successful marketing of their products, which is the securing of such a price as will assure the maintenance and expansion of the fruit-growing and canning industries on a sound commercial basis.

This season, in spite of the development of a sentiment in Great Britain in favour of Empire products, the increase in Imperial preferences as the result of the Ottawa Conference, and a 7 per cent. subsidy granted by the South African Government, canners are experiencing great difficulty in securing payable prices on the British markets for their apricots and pears, which represent the major portion of the export pack.

With the devaluation of the American dollar, prices have fallen to such a level as to nullify the preference that this Dominion should enjoy in the British market. Seeing that South Africa has already established a splendid reputation for the quality of her canned fruits, price becomes the deciding factor, and in gauging the potentialities of the United Kingdom market it is therefore necessary to review carefully the American position.

The application of the schemes at present being put into operation in America should result in increase in the price of canned fruits on the London market next season, provided, of course, there is no further devaluation of the American dollar. On the other hand, should the American Industrial Reconstruction Scheme assist in promoting increased domestic consumption of canned fruit at inflated prices and increased margins of profit to canners, this might prove an incentive to dispose of their exportable surplus at very keen competitive prices, as America's huge domestic consumption would be quite capable of carrying a reasonable export loss.

Any marked development in orchard planting in South Africa of canning varieties and of canning operations, therefore, depends very largely on canners being assured of a profitable market in Great Britain, and if American competition continues to retard such progress, an appeal must be made to the British Government to assure that Empire packers are not subject to the unfair competition of foreign canned goods, and that practical application is given the true interpretation of the Ottawa Agreement, which is so essential in the interests of Great Britain and her vast Dominions.

BREAD AND VITAMIN A

TO THE recent "Bread and Milk" Symposium of the Society of Chemical Industry, Dr. D. W. Kent-Jones contributed a valuable critical discussion of "Bleaching and Improving of Flour." Therein he raised many matters germane to the problems of human nutrition, among them the question whether the carotene content of wheat endosperm contributed, in bread, materially to the vitamin A intake of the consumer.

By a series of admittedly very rough approximations it is possible to obtain a little light on this matter, though it is necessary to make not a few assumptions in the process. The most recent work indicates that carotene has, for the experimental rat, about half the growth-promoting value of pure vitamin A. This is derivable from the fact that pure carotene is defined as possessing one million units of activity in a gram, while a good grade cod liver oil with a vitamin A activity of 500 units to the gram contains about 0·025 per cent. of the vitamin. Thus the unit of activity is present in one microgram of carotene and in half a microgram of vitamin A. It appears unfortunately to be the fact that animals under different laboratory conditions differ in their ability to convert carotene to vitamin A *in vivo*, and this makes all the more hazardous the assumption that man and the rat both show the same relative utilisation for carotene and vitamin A. As it will tell against the conclusion to which this argument is leading, we will therefore credit carotene with possessing for man the *same* value as the pure vitamin, weight for weight.

It is next necessary to state what are the average man's daily requirements for vitamin A; no one can at the present day do more than guess the amount, but it can hardly be less than what is contained in 4 gm. of cod liver oil, having the activity already mentioned, especially if no other sources of vitamin A or carotene (milk-fat, green leaves, etc.) are included in the diet. On this assumption a man requires daily 2,000 units of vitamin A or carotene, which is equivalent to 2 mgm. of either.

Dr. Kent-Jones gives four parts per million as the upper limit to the carotene content of wheat endosperm; it will therefore certainly be an over-estimate to attribute to the baked loaf, since carotene is one of the most easily oxidised of vitamins or pro-vitamins, a carotene content of two and a half parts per million. If we take the daily bread consumption of the average individual in this country to be 500 gm.—a deliberate over-estimate—we have twice more weighted the scales heavily in favour of bread as a source of vitamin A. That amount of

(*Continued on page* 38.)

The Annual Chemical Dinner held at the Hotel Great Central at the End of Last Year under the Chairmanship of Lord Leverhulme.

***Food Manufacture* table is in the foreground on the left.**

TRADE NOTES

The Sea-Going Dairy.

This is the title of a pamphlet recently issued by Messrs. J. Stone and Company, Ltd. It describes the firm's Super Emulsifier, an emulsifying machine which, although particularly adapted for use on board ship, is also quite interesting from a more general standpoint.

We take the following excerpt from this pamphlet. It is headed "Advantages of the Super Emulsifier":

1. Cream or the ice-cream mix produced on the Super Emulsifier is ready for use immediately it leaves the machine, as the full flavour is developed and the cream can be whipped at once without any delay for ageing. The ice-cream mix can be frozen immediately without any reduction in the increase in volume, commonly known in the trade as "swell" or "over-run."

2. Demands can thus be met immediately for cream and ice-cream mix instead of having to anticipate a possible demand by some 12 to 36 hours, since all other machines require this period of time for "ageing" their product before it develops its full flavour and texture and is fit to use.

3. Since the demands can be met so quickly, there is considerable saving in cold storage space.

4. The special design of circulating pump is greatly superior to existing paddle stirrers, requiring less power, giving even composition throughout, very rapid solution of the milk powder, and absolutely even rate of flow to the Super Emulsifier throughout the run. The composition and fat content of the mix is uniform right to the end, whereas other machines which use paddle agitators give a product near the end of the run which is too rich in fat—this special feature is obtained by feeding the machine from the delivery side of the pump, thus giving the same rate of flow whether the tank is full or nearly empty and avoiding all need for further regulation when once the machine has been started.

5. The machine occupies much less space than most other machines of equal capacity, an important consideration on board ship.

6. The machine is very economical as regards power, requiring only about one-half of that used by other machines of equal capacity.

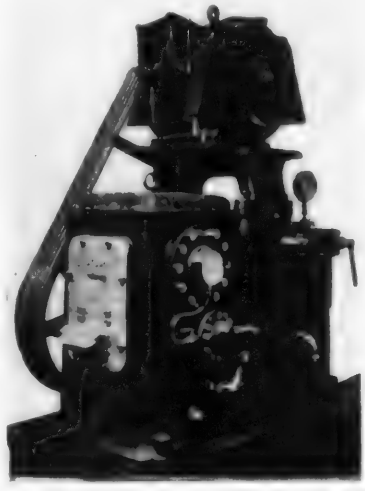
7. Lubrication to the Super Emulsifier is entirely automatic.

8. When a boiler is fitted to the machine, the same water is used over and over again, so that scaling of the elements or the inside of the boiler shell is avoided.

9. All parts are readily accessible for cleaning and sterilising.

A New Homogeniser.

The Brush Homogeniser has been designed and constructed for use in the dairy, chemical and other industries where really stable emulsions are absolutely imperative. A point of particular interest to the food manufacturer is



The Brush Homogeniser.

that a dividing ring is fitted to each plunger in order to prevent contamination of foodstuffs by the creepage of lubricating oil.

The homogeniser consists of a three-throw pump delivering the working fluid under pressures adjustable up to 4,000 lb. per sq. in., through the homogenising valve to the delivery reservoir. The whole machine (as will be seen from the illustration) is designed for easy cleaning, and is of good appearance. It delivers 500 to 750 gal. per hour at crankshaft speeds of 100 to 150 revolutions per minute.

* * *

Labelling.

An interesting labelling machine on the market is the "Sisson" Universal Labeller (sole makers: W. Sisson and Co., Ltd. Sole distributors: Bramigk and Co., Ltd.).

The specification gives the output as up to 9,000 per hour. The standard machine takes any round tins from 2⅛ in. to 4¼ in. diameter, and 2⅛ in. to 6¼ in. long, with or without lids. Smaller or larger sizes can be accommodated to order.

The changing over from one size of tin to another can be done in a few minutes, the design of the labeller being such that no spanners are required.

Starting and stopping is done by press-button control.

The machine has been designed for easy transport so that it can be used in different places to accommodate various lines or manufacture when required.

It can be towed from either end, and owing to the motor being integral with the machine, the only electrical connection necessary is the plugging in to the existing system at any desired point in the factory.

So far as labelling goes, the first end of the label is securely fixed to the package by two spots of an electrically heated cement. It is further secured by a special composition paste. Owing to the design of tensioning devices, the label is tightly drawn round the tin, and in the case of tins with lids there is claimed to be no danger of the lid coming off.

Further particulars of the "Sisson" Labeller may be had on application to Messrs. Bramigk and Co., Ltd.

* * *

Industrial Designs Competition.

We reproduce below some interesting extracts from the R.S.A. Report on the Competition of Industrial Designs, 1933. It is, we think, greatly to be regretted that the Society will not hold a similar competition in 1934, owing to the heavy cost of organising. This decision has been arrived at despite the increasing success of such competitions during the past ten years.

SUB-SECTION 11.—*Prize offered by Messrs. Spillers, Ltd., for a design for a Poster to advertise either their* (a) *Dog Biscuits,* (b) *Turog Bread, or* (c) *Self-Raising Flour.*

The awards are as follows:

> The prize of twenty-five guineas to Miss Hilary Yvonne Chappell, Birmingham Central School of Arts and Crafts.

"The entries were, on the whole, mediocre and lacking in originality. Although the subjects were all well-known and widely advertised products of everyday use, the majority of competitors failed because they had not appreciated the outstanding features of the line it was intended to advertise, and which afforded ample opportunity for 'telling a story' by poster."

SUB-SECTION 25.—*Prizes offered by Messrs. Cadbury Brothers, Ltd., for designs for Chocolate Boxes.*

The awards are as follows:

The first prize of £30 to Miss Ailsa Mary Baker, Weston Acres, Woodmansterne, Banstead, Surrey.

The second prize of £15 to Miss Mary Dempster McEwen, Lethington, Inverness, Scotland.

The third prize of £5 to Hugh Richard Hosking, 41, Westcotes Drive, Leicester.

"This sub-section produced a most interesting display. The level of design was very high, and only after long discussion were the prize-winners selected. Many of the other designs could be used."

SUB-SECTION 27.—*Prize offered by Messrs. Brown and Rawcliffe, Ltd., for a Label design for a Can of English Fruit or Vegetables.*

The award is as follows:

The prize of ten guineas to Frederick Charles Potter, "Kilcoral," Barnham, Sussex.

"The general standard of merit in this sub-section was not high. Where any originality was shown, the trade requirements, such as lettering display, were not efficiently catered for, and where these latter were observed, originality was lacking.

"The prize was awarded to a design which, though it is doubtful whether it would be successful with the majority of trade buyers of canned fruit labels, observes trade requirements completely and shows a nice sense of simplicity in colour and design; the lettering is handled in an intelligent and original manner."

* * *

Efficient Lighting.

The inefficient lighting to be observed in a great number of food factories is obviously a deterrent to first-class workmanship. Good lighting calls for no more than a fraction of overhead costs—and, what is even more important, it is never unjustifiable expenditure.

Readers who are interested in making the most of their office and factory premises, summer and winter alike, would be well advised to get a copy of "Your Profit Earner"—a pamphlet recently issued by the Benjamin Electric, Ltd., sponsors of Benjamin Planned Lighting.

* * *

New Emulsifying Agent.

We have received an interesting sample of an emulsifying agent known as Palsgaard Emulsion Oil.

This oil is for use in making up water-in-oil emulsions and is said to form extremely stable and finely divided products.

It is described as an oil-soluble colloid which keeps for a very long time without decomposition and is quite edible, with very little taste or smell. It is already used extensively in the margarine industry.

The photograph shows Mr. H. J. Judd, general sales manager of the United Glass Bottle Manufacturers, Ltd., who has been appointed director of the company.

For the past 14 years Mr. Judd, whose experience in this country and in the U.S.A. has been a particularly wide one, has been in charge of the sales and production departments of the U.G.B.

* * *

Binding Copies of "Food Manufacture."

We would like to draw the attention of those readers who have not yet obtained binders to the many advantages presented by the inclusion of each year's issues in one convenient, attractive, and durable cover.

In this way each separate copy may be easily detached when necessary, while the annual index may be pasted inside the binder for constant reference.

Binders may be had direct from Leonard Hill, Limited, 231-2, Strand, London, W.C. 2, price 5s. for this country, and 7s. 6d. for abroad; post and packing free in both instances.

* * *

Morris-Commercial Order Record.

As evidence of the upward trend of trade, it is interesting to note that Messrs. Morris Commercial Cars, Ltd., have, during the past three months, received a substantial increase of orders for commercial vehicles, as compared with the same period of the three preceding years. Recently the orders reached a figure which is a record in the history of the Company, whilst the total orders for September, October, and November show an increase of 80 per cent. over the corresponding period in 1933.

It is felt that this happy state of affairs is primarily due to the general trade revival, allied to the fact that Messrs. Morris Commercial now have a most comprehensive range of four- and six-cylinder vehicles to cover the requirements of every trade. Secondly, the new Road-Rail Act, which increases the taxes on heavy road vehicles, particularly those running on oil, has led to an increased demand for light and medium weight vehicles, principally those of 30 cwt., 2 ton, 3 ton, and 3½ ton capacity.

Messrs. Morris Commercial Cars expect an even greater demand for these vehicles this year and are making the necessary arrangements for a larger output.

* * *

Cellactite Ventilators.

More and more efficient ventilation is being accorded its proper place as an important point in constructional design. For whatever purpose a building is to be used, ventilation is a factor of efficiency. Particularly is this so in buildings occupied by industrial undertakings, where workers' output can in many cases be related directly to the provision of healthy and comfortable conditions. Apart from this, many processes call for controlled atmospheric conditions, or for ventilation to disperse steam or fumes, and this must be effective in all states of the weather without draught or danger of water ingress.

Simple ventilating devices exemplified in jack roofs with louvres, or types with a curved vent, often fail in practice because they function with efficiency only under one set of wind and weather conditions, possibly giving extractive effect at times and exactly the reverse when wind conditions are unfavourable. Nevertheless, their use adds considerably to the cost of roofing.

As an alternative, special metal ventilators have been tried, with some initial success, but as is inevitably the case with unprotected metal, trouble arises from corrosion, and efficiency falls off.

The undoubted success of Cellactite incorrosible steel-cored corrugated sheets appears to have created a natural demand for an efficient ventilator in uniform material, combining correct ventilation under all weather conditions with complete permanence.

How the Cellactite "Medway" Ventilator accomplishes this is described in the pages of "Cellactite Ventilators and Ventilation Data," an attractive booklet issued by Cellactite and British Uralite, Limited.

* * *

Electric Traction.

An interesting booklet of blue prints has just been sent us by the Clayton Equipment Co., Ltd. It contains information, illustrations, and blue prints relating to Clayton electric trucks and tractors. Among the advantages offered by the electric type of vehicle are simplicity in operation and maintenance, and entire absence of noise, fumes, and fire risk. One truck with a driver is said to perform the work of eight men.

By reason of its four-wheel steering, large steering lock, wide range of motor speeds, and high-efficiency worm drive, it is claimed that the Clayton electric truck is able to negotiate any bend, however sharp, and any kind of gradient.

INFORMATION and ADVICE

SAUERKRAUT—PICKLED CUCUMBERS—FLAVOURING ESSENCES — GOLDEN SYRUP — VITAMINS — SODIUM GLUTAMATE — CYSTINE—DIABETIC JAMS—DATES—FISH PASTE—LECITHIN— CANNING APRICOT PULP

Sauerkraut.

1,504. *I would like to add to the lines we produce now pickled cucumber and sauerkraut of the Continental type and method.*

This country having a semi-tropical climate, I doubt whether these articles would keep for any length of time in ordinary open containers. It will therefore be necessary to have them preserved or canned in closed tins or suchlike.

Cucumbers and cabbages are plentiful during the season at reasonable prices. A fair amount of trade could be done if a good article is produced. (South Africa.)

You might work on the following lines. Cut up the cabbage (white) and lay it on a table. To each 100 lb. of the cut cabbage add 7 lb. of pure table salt through a fine sieve and mix well. Allow it to remain on the table for 24 hours, turning it over at the end of the day and allowing it to drain. Next day add 3 lb. of salt and mix well. Then pack tightly in a clean cask to ferment, leaving the bung loose in order to permit escape of gas. When fermentation is complete, drive in the bung tight.

For filling into 2 lb. tins, the sauerkraut is cooked and filled boiling hot into the tins together with three small "hot dogs" which have been previously cooked separately.

Close the tin immediately.

Then give them 15 minutes at 245° F. in the retort.

Pickled Cucumbers.

Break the cucumbers in half and fill loosely into a cask, the head of which has been removed.

Replace the head on the cask and fasten it down so that the cucumbers will not float.

Now fill up with a light brine of 2½ lb. of salt to each gallon of water.

Allow to stand for 4 to 6 days, until the cucumbers have fermented.

Then transfer them to another cask and head up. Add through the bunghole 2 oz. of benzoate of soda to each 50 gal. capacity of cask. Fill up with brine containing 3½ lb. of salt to each gallon of water.

Bung up and stand for 10 days.

Then run out the brine through the bunghole and fill the cask with water at 160° F.

Stand for 24 hours.

Repeat with hot water on the two succeeding days.

Now peel and slice the cucumbers.

Place the slices in a 4½ per cent. solution of acetic acid and water.

Stand for 48 hours.

Fill into glass jars with the slices facing the sides. Add white mustard seeds and pale malt vinegar. Seal with cap.

Flavouring Essences.

1,505. *We are contemplating the manufacture of wine essences in ginger and various flavours, for sale to the public, and to which are to be added sugar and water. Cost is, of course, the primary consideration, and we shall be obliged if you will supply recipes and the names of suppliers of suitable materials.* (Yorkshire.)

The enquirer was referred to various essence firms and to an expert compounder. The preparation of essences, such as ginger, does not stop at mere extraction with alcohol. There is the larger and more difficult job of blending these with other essences, such as those of orange, lime and lemon, to round off the flavour and to impart a distinctive individuality to the product. The thing to do is to get a chemist of experience to go into your case thoroughly, taking into consideration your particular circumstances, and to aim at a special blend which will give your products an individuality and so differentiate them from the ordinary run of such products.

Golden Syrup.

1,506. *Kindly supply information on the preparation of golden syrup.* (South Africa.)

This information was supplied. Briefly it involves, as an example of one method, dissolving white sugar in boiling water. The steam is cut off and equal weights of glucose and molasses added. The temperature is raised to a certain point and the gravity brought to a specified value by addition of water (previously boiled) at the same temperature.

Maple sugar may be used in place of molasses.

Vitamins.

1,507. *Can you indicate any article or publication in which relative potencies of materials containing vitamins are summarised? A statement which attempts to be, however roughly, quantitative is sought; for example, how many times richer in vitamin B is fresh malt than, say, fresh lettuce?* (Ireland.)

The most complete work of reference on this subject is Dr. Ethel Browning's *The Vitamins.* It is rather expensive —42s.—but runs to nearly 600 pages. There are several good publications, smaller and cheaper, as, for example, Professor Drummond's *Recent Researches on the Nature and Function of Vitamins* (2s.) and Professor Plimmer's *Food, Health, Vitamins* (3s.).

Sodium Glutamate.

1,508. *Acid sodium glutamate is said to be a "vegetable extract." Can you tell us from what vegetables it is made?* (Australia.)

Apparently there is some confusion of terms. Glutamic acid (from which sodium glutamate is prepared) occurs in both animal and vegetable proteins, and is one of the constituents of vegetable extracts. The starting point is the protein, and this may be fish or other animal protein. Beetroot molasses is a promising source of glutamic acid. In China, wheat protein seems to be the main raw material. The particular difficulty there is to make profitable use of the starch which occurs as a by-product.

Reference should be made to previous issues for information on its manufacture. It is one that requires special plant and expert chemical control. It is useless to contemplate manufacture unless well backed by money and a specialised technical staff. If this is a serious enquiry we are prepared to take up the matter further

Cystine.

1,509. *Could you please give me any information on Cystine, the source from which it can be obtained, its food value, and in what foods it is contained in appreciable amounts? Has it outstanding value in foods for animals?* (London.)

We do not understand the drift of this question. Cystine is a sulphur-containing amino acid ($C_6H_{12}N_2S_2O_4$) which enters into the composition of many proteins. It is a crystalline compound insoluble in water and alcohol.

In metabolism, cystine gives rise to glucose. Its sulphur

is partly excreted as inorganic sulphate and is partly responsible for the " neutral sulphur " of the urine.

The energy value of cystine (as determined by the bomb calorimeter is 4·14 cals. per gm. (lean beef is 5·78 and glucose is 3·74).

There is a German preparation called " Cystin " used for bladder troubles. This contains juniper, berberine, arnica, etc.

If we knew more about what is in your mind we should be able to give more information on the subject of your enquiry.

Diabetic Jams.

1,510. *We are anxious to get in touch with manufacturers of diabetic jams, and would esteem it a great favour if you could give us the names of manufacturers.* (London.)

Some time ago two or three firms made so-called diabetic jams and marmalade. In these the sugar was replaced by glycerin. It is doubtful whether any firms are now making them, as since the introduction of insulin, diabetic patients are no longer debarred from having sugar—in fact, it is essential in their diet.

We understand that manufacturers of so-called diabetic foods now object to the use of this term " diabetic " in connection with their foods because there is really no such thing as a food which will cure diabetes. The foods that they now make are prepared in such a way as to give certain balances of carbohydrate, protein and fat, and it is left to the doctor to prescribe that particular variety of the food which has the balance of the various constituents which he thinks best suited to the patient. From this you will understand that these foods could be used for other than diabetic patients. This explains why manufacturers have dropped the term.

Dates.

1,511. *May we ask if you can give us any information on the question of the preparation of dates for packing in boxes as a fancy grade?*

We should like to know whether ordinary dates are used and separated and varnished, and also we would like to have some information on the question of stuffed dates if available. (Lincolnshire.)

In order to coat the dates with an airtight coating to prevent them from drying in the event of the natural skin becoming broken during repacking, they may be dipped in a solution such as the following:

Gum arabic	4 oz.
Glucose	4 lb.
Acetic acid, 30 per cent.	1 fl. oz.
Water	4 gal.

Dissolve the gum in cold water. Add the glucose and boil. Then add the acid. Dip the dates at about 180° to 190° F. (not over 190°). Spread them out to dry and pack while warm. Sometimes the top is wiped with a little glycerin. Close the boxes as airtight as possible. If they are packed too cold the skin is liable to crack.

In preparing Stuffed Dates, any signs of sugar should be washed off with weak, warm soda water. After that they are wiped dry and spread out. The stalk end is slit with a knife and stone squeezed out. Stuff with a piece of preserved angelica, leaving the end exposed. Pack in small boxes.

Fish Paste.

1,512. *The Ministry of Agriculture and Fisheries has referred me to you for information on the making and packing of fish paste. I would be glad to have any information you can give me, or any articles, pamphlets or books you can recommend as likely to be useful to the beginner.* (Cumberland.)

The best we can do at this stage is to refer you to a general article published in the June, 1932, issue of this journal. If, after you have read this article, you will tell us exactly what type of fish paste you have in view, we will let you have a recipe upon which to commence work.

Lecithin.

1,513. *We are informed that you are featuring the use of lecithin for baker and confectionery lines. We might inform you that we have many connections with bakers and confectionery and margarine manufacturers in this country and have special interests in that product. In fact, about several years ago we brought in Yolk Lecithin from Germany as emulsifying agents for margarine, but owing to its expensive price at 10s. a kilo, business came to a standstill. It would be a good thing if you will introduce to us the distributors or arrange for sending a pamphlet of " Lecithin " for use of bakers and confectioners as well as artificial butter makers.* (Japan.)

A suitable reply was made to a letter from which the above points of interest have been abstracted for publication here.

Canning Apricot Pulp.

1,514. *I am in need of information on the process used in the canning of apricot pulp (from fresh apricots) in large cans (about 11 lb.), or information regarding literature on the subject.* (South Africa.)

Apricot pulp is usually packed in one of two forms; either as a purée or as solid pack halves. The latter is probably more frequently met with, as it is chiefly in this form that the fruit is purchased for jam making, although a proportion of " sieved apricot pulp " or purée is also often used for this purpose.

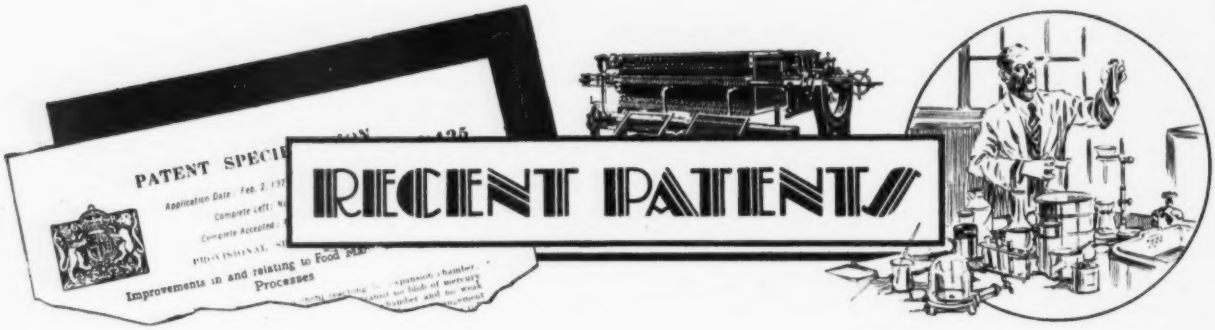
Dealing first with the " solid pack halves," a pack of this description is most economically produced when allied with the canning of dessert fruit in syrup. After the prime fruit has been sorted out, the sound fruit remaining is halved and the stone removed, and washed to remove any dirt, natural yeasts on the surface, bacteria, etc. This operation is best accomplished in a continuous washer, similar to the standard plant used in tomato canneries. The fruit is then heated in open pans fitted with a perforated steam coil. It is advisable to add a small quantity of water to the pan to prevent scorching. The temperature is brought to about 200° F. and the pulp filled into cans, which may be sealed immediately without previously exhausting.

An alternative method which obviates the necessity of adding any water is to pack the cold fruit into the cans and exhaust for about 10 to 12 minutes at 212° F. in a steam or hot water exhaust box. The cans should then be sealed immediately.

Also a combination of the two methods is practised by some packers, about one-third of the hot pulp being filled into the cans first, followed by two-thirds of cold fruit. In this case a shorter exhaust is necessary (about 5 minutes), and it has the advantage over packing all cold fruit in that the hot pulp fills up the interstices between the cold halves, thus ensuring a better fill, and leaving less air in the can. Pulp packed in this way has a better finished appearance than pulp packed by filling all hot pulp as described above. Whichever method is used, No. 10 cans require about 40 to 45 minutes' processing at 212° F. to give a reasonable margin of safety in the factory.

Apricot purée may be made in a similar way to the open pan method as described above; only the heating should be continued until the fruit is quite soft and broken. Fragments of fruit and trimmings may be included if purée is being prepared. When cooked soft the fruit is brushed through a sieve of about ¼ inch mesh. It is not, of course, necessary to remove the stones previously, as the sieve will do this. The pulp should be filled hot into the cans (about 180° to 200° F.) and immediately sealed. Processing is the same as for " solid pack halves."

After processing apricot pulp it is better not to cool too quickly, contrary to general canning practice, as the colour is improved by slow cooling.



Published Abstracts

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.

Lactose Preparations. A drawback to popular use of desiccated milk whey and other liquids containing a high proportion of lactose is the marked hygroscopicity resulting from desiccation in the ordinary spray type desiccator. The product readily cakes and can therefore only be stored or despatched in expensive sealed containers. A further obstacle to popularisation is the agglomeration into lumps when attempts are made to dissolve in water. This unfortunate tendency of milk whey desiccated preparations to form cakes as a result of moisture absorption can be traced to the anhydrous form in which the milk sugar is present. Any method which will convert the latter into its monohydrate, which is non-hygroscopic, will therefore confer a high degree of stability for commercial purposes. A previously applied method, however, has not been particularly successful, since it involves a relatively expensive scheme comprising absorption of water, formation of cake, and disintegration of the cake. Advantages in the way of cheapness, palatability, and solubility of the hydrated product are now claimed for the process described in United States Patent 1,928,135. In this case a special plant has been devised which permits of controlled hydration of the previously desiccated powdered lactose-containing material by treatment with wet steam. The final product, which contains about 7 per cent. of water (calculated upon the weight of milk sugar present) is stated to preserve its finely divided form and therefore requires no grinding prior to packaging. Another interesting claim is to the effect that a considerable proportion of the proteins in the product are retained in the uncoagulated and soluble form and thus increase the nutritive value. (Application filed February 15, 1932; published September 26, 1933.)

Prevention of Rancidity in Edible Oils and Fats. Incorporation of a minute proportion of certain phenol compounds has been discovered to effect a surprisingly marked retardation in the rate of oxidation and decomposition of lard and other edible substances, both in the pure state and when used as shortening in pie crusts, etc. Examples of this type of retarders, which are practically insoluble in water and readily soluble in the oils and fats in question, are adrenaline (a substituted pyrocatechol) and the dimethyl ether of pyrogallol. Exceptional suitability is claimed in the case of condensation products of phenols with ketones and aldehydes. A substance of this class is readily obtained by condensing pyrogallol with acetone in the presence of hydrochloric acid, and satisfactorily retards rancidity when incorporated in the minute proportion of 0·01 per cent. or less. It appears to be non-toxic in the pure state, and, being insoluble in water, cannot be absorbed from the digestive tract to any appreciable extent. Under certain conditions it is said to produce a 1,000 per cent. improvement in the keeping quality of lard. (English Patent 401,018. United States Convention Date, May 12, 1931.)

Refrigeration with Dry Ice. To prevent the presence of an excessive amount of carbon dioxide gas in the atmosphere of refrigerating chambers for fish, fruit, etc., cooled with solid carbon dioxide, a device has been patented whereby the whole or part of the gas evolved from the solid refrigerant enters the refrigerating chamber itself via an injector, which simultaneously causes inflow of outside air. A valve or other controlling mechanism on the air supply side of the injector regulates the ratio of air to gaseous carbon dioxide. Independent control of the temperature of the refrigerated chamber is achieved as distinct from that of the carbon dioxide content of its atmosphere by virtue of the fact that the temperature depends upon the total rate of evaporation of the solid carbon dioxide, while the ratio of air to gaseous carbon dioxide is adjusted with the aid of the regulating valve. (English Patent 400,658.)

Bread Manufacture. A scheme which is claimed to achieve uniform consistency throughout the internal structure of the baked loaf comprises subjecting the dough to a flattening operation, laminating it in the tin with vertical laminæ at right angles to the longitudinal axis of the tin and proving and baking the assembled dough laminæ in the tin. Before flattening, a handling up or moulding treatment of the dough is recommended, with a view to sealing its surface. In contrast to ordinary bread, the cellular structure (when cut transversely to the longitudinal axis) of a loaf prepared as described reveals bean-shaped cells with their longer axes in planes at right angles to the longitudinal axis of the loaf. The colour, texture, crumb, keeping qualities, and flavour of the baked loaf are stated to be improved by the preliminary treatment of the dough. (English Patent 400,619.)

BREAD AND VITAMIN A

(*Continued from page* 33.)

bread will clearly contain 1¼ mgm. of carotene, little over half what we have concluded to be the daily requirement.

In view of the numerous assumptions favourable to carotene made in the above argument, it will probably be much nearer the truth to say that a normal man requires, as his daily vitamin A ration, somewhere near 5 mgm. of carotene, and that his daily bread normally contributes less than 1 mgm.—a fraction, even if a significant fraction, of what he requires. From the physiologist we urgently require some guidance on this matter of needs; the cereal chemist for his part should be able to tell us more than he yet can about the actual average daily consumption of carotene in bread.

"IGNORAMUS."